Technical Support Document For the April 02, 2012, Alamosa and Lamar Exceptional Event

COLORADO
Department of Public Health & Environment

Prepared by the
Air Pollution Control Division
Colorado Department of Public Health and Environment

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Executive Summary

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature[1] (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls). In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007 (72 FR 13560). On May 2, 2011, in an attempt to clarify this rule, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review. The EER allows for states and tribes to "flag" air quality monitoring data as an exceptional event and exclude those data from use in determinations with respect to exceedances or violations of the NAAQS, if EPA concurs with the demonstration submitted by the flagging agency.

Due to the semi-arid nature of large parts of the state, Colorado is highly susceptible to windblown dust events. These events are often captured by various air quality monitoring equipment throughout the state, sometimes resulting in exceedances or violations of the 24-hour PM_{10} NAAQS. This document contains detailed information about the large regional windblown dust event that occurred on March 18, 2012. The Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD) has prepared this report for the U.S. Environmental Protection Agency (EPA) to demonstrate that the elevated PM_{10} concentrations were caused by a natural event.

EPA's June 2012, Draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states, "the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed…". In addition, in Colorado it has been shown that sustained wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see Blowing Dust Climatologies available at http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2). For this blowing dust event, it has been assumed that sustained winds of 30 mph and higher or wind gusts of 40 mph and higher can cause blowing dust in the San Luis Valley of south-central Colorado and the plains of southeast Colorado.

On April 2 of 2012, a powerful spring storm system caused exceedances of the twenty-four hour PM_{10} standard in Alamosa and Lamar, Colorado. An exceedance was recorded in Alamosa at the Adams State College monitor with a concentration of 389 $\mu g/m^3$. Approximately 180 miles to the east in Lamar, an exceedance of the PM_{10} standard occurred at the Lamar Municipal Building monitor with a reading of 163 $\mu g/m^3$.

The exceedance in Alamosa was the result of intense surface winds produced by a very tight pressure gradient in the wake of a passing cold front. The surface winds were predominantly out of an east to southeast direction and were likely enhanced by some of the mountain passes found in the Sangre De Cristo range that bounds the eastern side of the San Luis Valley. These winds moved over dry soils which resulted in significant blowing dust in Alamosa. Lamar was likewise impacted by post-frontal winds, but from a northerly direction. Lamar also received a brief period of strong outflow winds from evening thunderstorms

[1] Section 319 of the Clear Air Act (CAA), as amended by section 6013 of the Safe Accountable Flexible Efficient-Transportation Equity Act: A Legacy for Users (SAFE-TEA-LU of 2005, required EPA to propose the Federal Exceptional Events Rule (EER) no later than March 1, 2006.

located to the east in southwest Kansas. Blowing dust produced by those downburst winds also likely contributed to the PM_{10} exceedance recorded in Lamar. All of the surface features which aided in producing blowing dust in Alamosa and Lamar were associated with a strong upper-level trough that was moving across the western United States. This storm system transported PM_{10} dust into the southern and southeastern portions of Colorado.

APCD is requesting concurrence on exclusion of the PM_{10} exceedance values from Alamosa-Adams State College (08-003-0001) and Lamar Municipal Building (08-099-0002) on April 2, 2012. APCD is also requesting concurrence on exclusion of the elevated PM_{10} value from Lamar Power Plant (08-099-0001) on April 2, 2012.

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1.0 Exceptional Events Rule Requirements

In addition to the technical requirements that are contained within the EER, procedural requirements must also be met in order for EPA to concur with the flagged air quality monitoring data. This section of the report lays out the requirements of the EER and discusses how the APCD addressed those requirements.

1.1 Procedural Criteria

This section presents a review of the procedural requirements of the EER as required by 40 CFR 50.14 (Treatment of Air Quality Monitoring Data Influenced by Exceptional Events) and explains how APCD fulfills them.

The Federal EER requirements include public notification that an event was occurring, the placement of informational flags on data in EPA's Air Quality System (AQS), submission of initial event description, the documentation that the public comment process was followed, and the submittal of a demonstration supporting the exceptional events flag. APCD has addressed all of these procedural and documentation requirements.

Public notification that event was occurring (40 CFR 50.14(c)(1)(i))
APCD issued Blowing Dust Advisories for portions of Eastern Colorado and the San Luis Valley advising citizens of the potential for high wind/dust events on April 2, 2012. This area includes: Pueblo, Springfield, Lamar, La Junta, Trinidad, Alamosa and Las Animas. The advisories that were issued on April 2, 2012 can be viewed at: http://www.colorado.gov/airquality/forecast_archive.aspx?seeddate=04%2f02%2f2012 and are included in Appendix A.

Place informational flag on data in AQS (40 CFR 50.14(c)(2)(ii))
APCD and other applicable agencies in Colorado submit data into EPA's AQS. Data from both filter-based and continuous monitors operated in Colorado are submitted to AQS.

When APCD and/or another agency operating monitors in Colorado suspects that data may be influenced by an exceptional event, APCD and/or the other operating agency expedites analysis of the filters collected from the potentially-affected filter-based air monitoring instruments, quality assures the results and submits the data into AQS. APCD and/or other operating agencies also submit data from continuous monitors into AQS after quality assurance is complete.

If APCD and/or the applicable operating agency have determined a potential exists that the sample value has been influenced by an exceptional event, a preliminary flag is submitted for the measurement when the data is uploaded to AQS. The data are not official until they are certified by May 1st of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag can be confirmed in AQS.

Notify EPA of intent to flag through submission of initial event description by July 1 of calendar year following event (40 CFR 50.14(c)(2)(iii))
In early 2011, APCD and EPA Region 8 staff agreed that the notification of the intent to flag data as an exceptional event would be done by submitting data to AQS with the proper flags and the initial event descriptions. This was deemed acceptable, since Region 8 staff routinely pull the data to review for completeness and other analyses.

On April 2, 2012, two sample values greater than 150 µg/m^3 were taken at multiple sites across southern Colorado during the high wind event that occurred that day. These were the monitors located in Alamosa at Adams State College (SLAMS), and in Lamar at the Municipal building monitor (SLAMS). All of these monitors are operated by APCD in partnership with local operators.

Document that the public comment process was followed for event documentation (40 CFR 50.14(c)(3)(iv))
APCD posted this report on the Air Pollution Control Division's webpage for public review. APCD opened a 30-day public comment period on February 5, 2015 and closed the comment period on March 9, 2015. A copy of comments received will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv).

> ***NOTE: No comments were received during the public comment period. Some minor non-substantial grammatical and formatting corrections were made.***

Submit demonstration supporting exceptional event flag (40 CFR 50.14(a)(1-2))
APCD will submit this document, along with any comments received (if applicable), and APCD's responses to those comments to EPA Region VIII headquarters in Denver, Colorado. The deadline for the submittal of this demonstration package is June 30, 2015.

1.2 Documentation Requirements

Section 50.14(c)(3)(iv) of the EER states that in order to justify excluding air quality monitoring data, evidence must be provided for the following elements:

a. The event satisfies the criteria set forth in 40 CFR 501(j) that:
   (1) the event affected air quality,
   (2) the event was not reasonably controllable or preventable, and
   (3) the event was caused by human activity unlikely to recur in a particular location or was a natural event;
b. There is a clear causal relationship between the measurement under consideration and the event;
c. The event is associated with a measured concentration in excess of normal historical fluctuations; and
d. There would have been no exceedance or violation but for the event.

2.0 Meteorological Analysis of the April 2, 2012, Blowing Dust Event and PM_{10} Exceedance – Conceptual Model and Wind Statistics

On April 2 of 2012, a powerful spring storm system caused exceedances of the twenty-four hour PM_{10} standard in Alamosa and Lamar, Colorado (Figure 1). An exceedance was recorded in Alamosa at the Adams State College monitor with a concentration of 389 $\mu g/m^3$. Approximately 180 miles to the east in Lamar, an exceedance of the PM_{10} standard occurred at the Lamar Municipal Building monitor with a reading of 163 $\mu g/m^3$. The elevated readings and the location of each of the monitors are plotted on the maps of the Greater Alamosa and Lamar areas in Figure 2 and Figure 3, respectively. The exceedance in Alamosa was the result of intense surface winds produced by a very tight pressure gradient in the wake of a passing cold front. The surface winds were predominantly out of an east to southeast direction and were likely enhanced by some of the mountain passes found in the Sangre De Cristo range that bounds the eastern side of the San Luis Valley. These winds moved over dry soils which resulted in significant blowing dust in Alamosa. Lamar was likewise impacted by post-frontal winds, but from a northerly direction. Lamar also received a brief period of strong outflow winds from evening thunderstorms located to the east in southwest Kansas. Blowing dust produced by those downburst winds also likely contributed to the PM_{10} exceedance recorded in Lamar. All of the surface features which aided in producing blowing dust in Alamosa and Lamar were associated with a strong upper-level trough that was moving across the western United States.

EPA's June 2012, Draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states, "the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed…". In addition, in Colorado it has been shown that wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see Blowing Dust Climatologies available at http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2). For this blowing dust event, it has been assumed that sustained winds of 30 mph and higher or wind gusts of 40 mph and higher can cause blowing dust in Colorado.

Figure 1: Locations of Alamosa and Lamar, Colorado.

High PM10 Natural Event in Colorado (April 2, 2012)

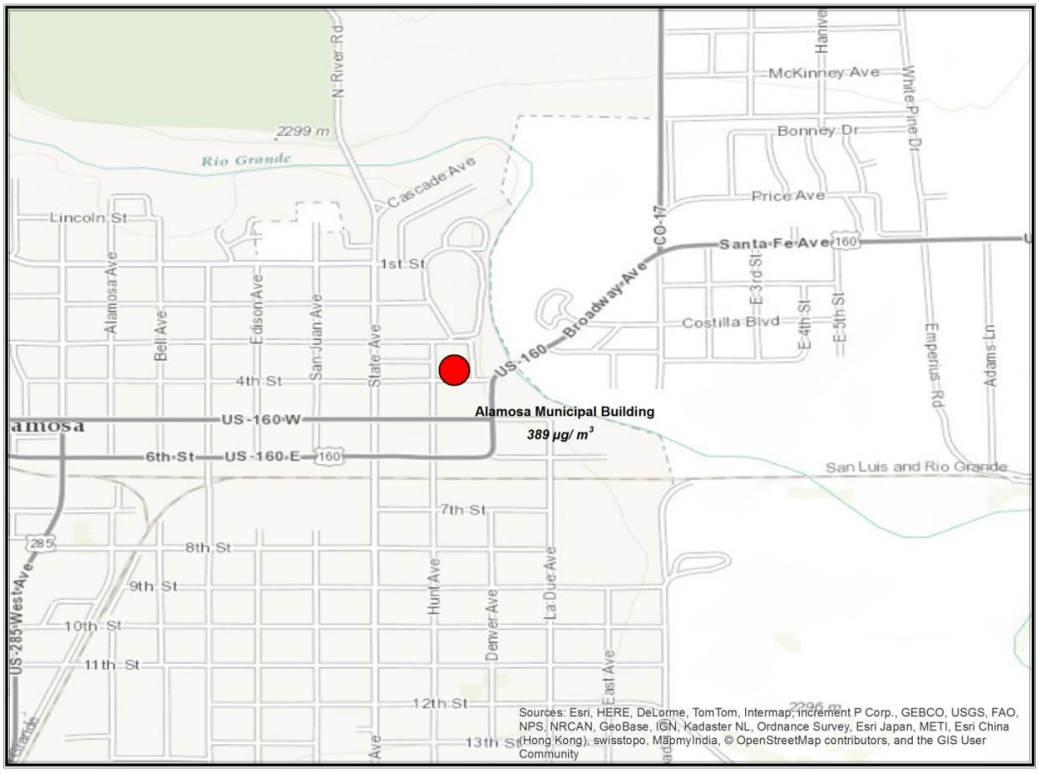

Figure 2: 24-hour PM_{10} concentration for Alamosa Municipal Building monitor, April 2, 2012.
(Source: http://webapps.datafed.net/datafed.aspx?dataset=AQS_D&parameter=pm10)

High PM10 Natural Event in Colorado (April 2, 2012)

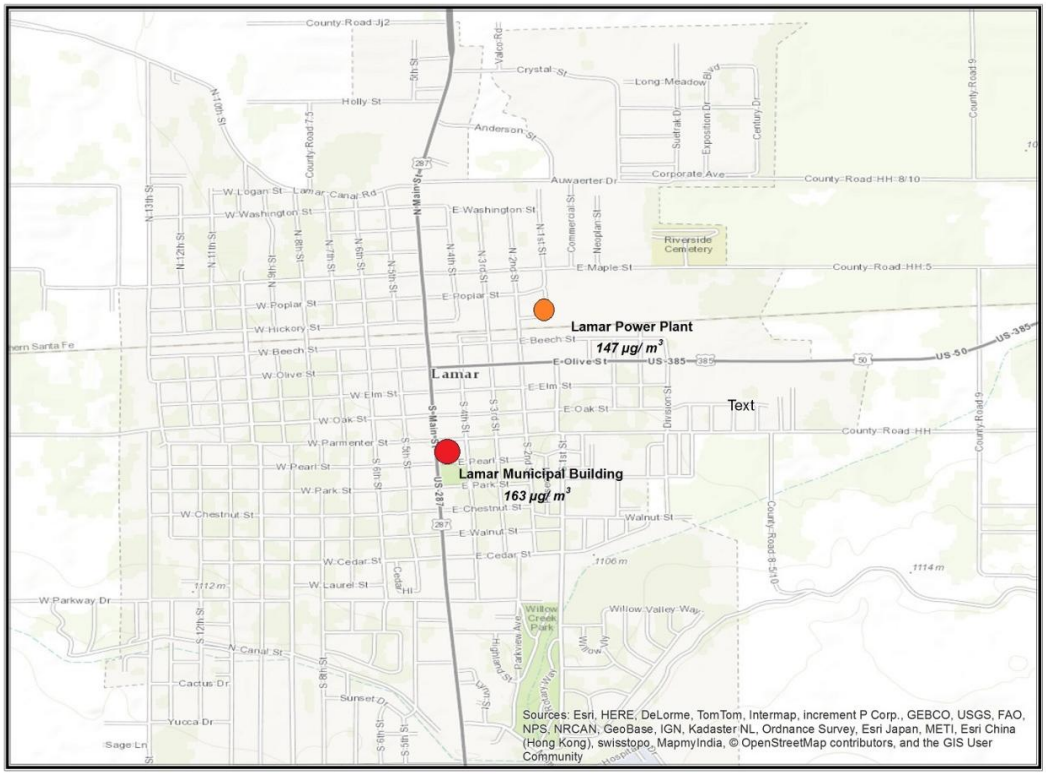

Figure 3: 24-hour PM_{10} concentrations for Lamar monitors, April 2, 2012. (Source: http://webapps.datafed.net/datafed.aspx?dataset=AQS_D&parameter=pm10)

The upper level trough associated with this storm system is shown on the 700mb and 500mb height analysis maps at 5 AM MST, April 2, 2012 in Figure 4 and Figure 5, respectively. The 700mb level is located roughly 3 kilometers above mean sea level (MSL) while the 500mb level is approximately 6 kilometers above MSL. These two charts show that a deep trough of low pressure was present at both the 700 and 500mb level at the onset of the blowing dust event of April 2, 2012, and that it was moving over the southwestern United States. This is a typical upper-air pattern for blowing dust events in Colorado (see previous exceptional event documents located at http://www.colorado.gov/airquality/tech_doc_repository.aspx#exceptional_events).

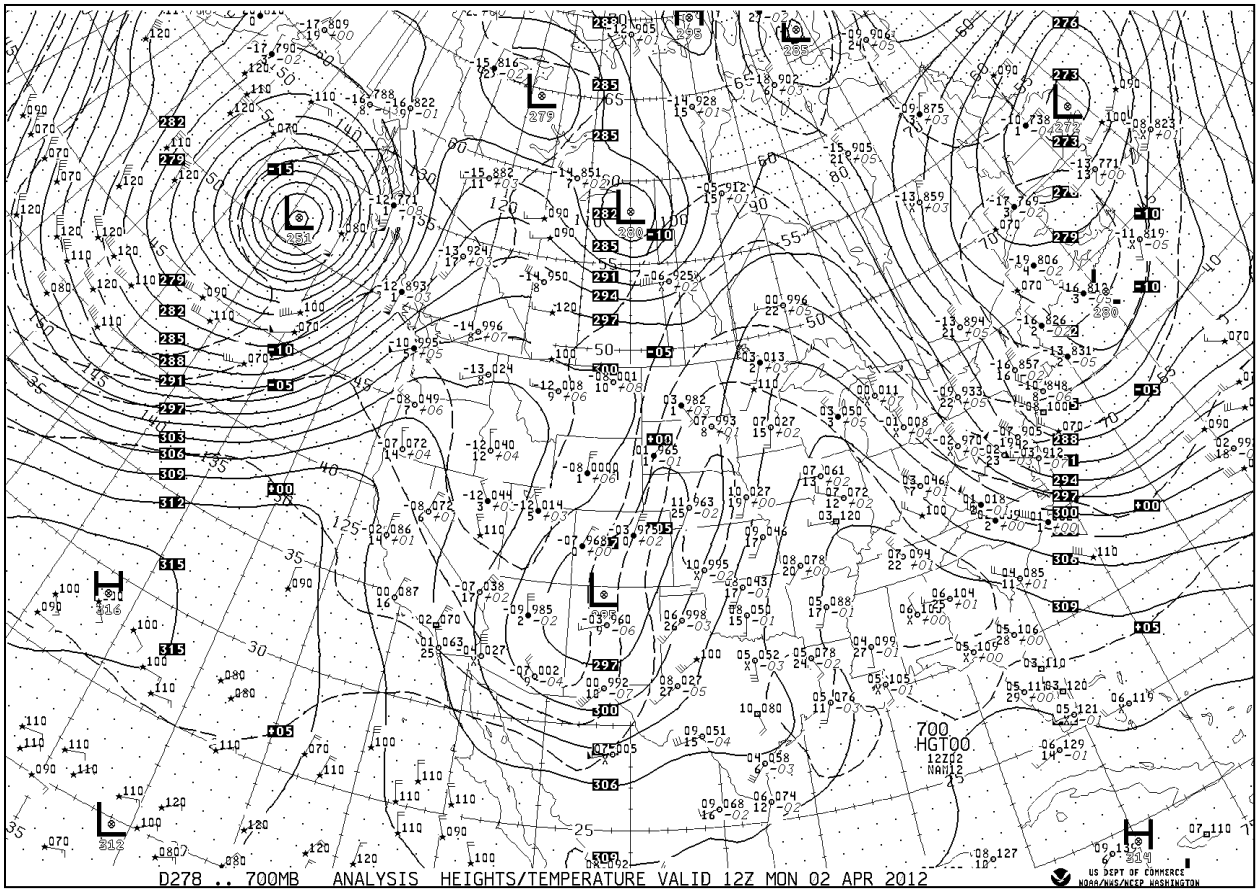

Figure 4: 700mb (about 3 kilometers above mean sea level) analysis for 12Z April 2, 2012, or 5 AM MST April 2, 2012.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

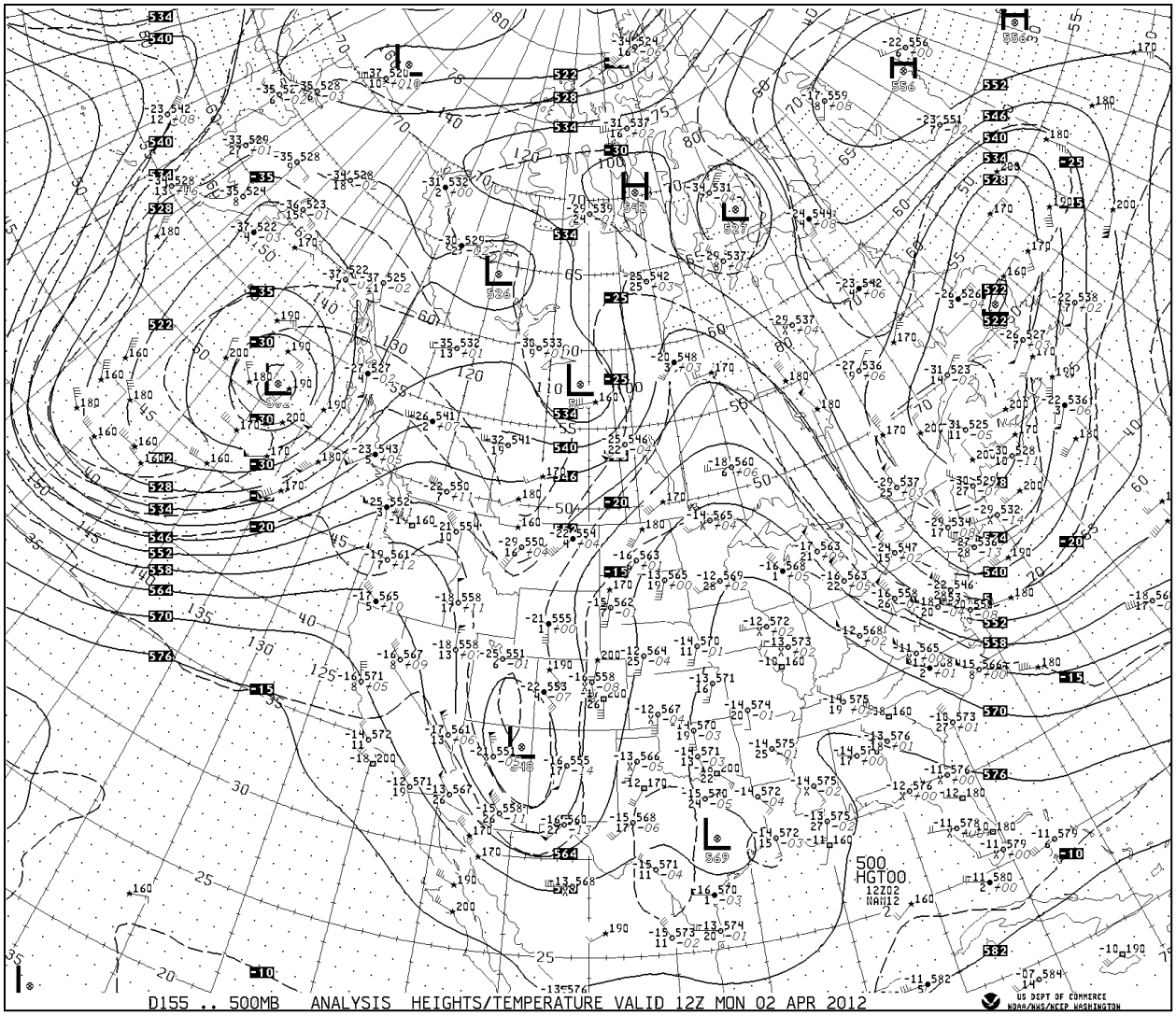

Figure 5: 500mb (about 6 kilometers above mean sea level) analysis for 12Z April 2, 2012, or 5 AM MST April 2, 2012.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

The surface weather associated with the storm system of April 2, 2012, is presented in Figure 6 and Figure 7. Significant surface features at 5 AM MST (12Z, Figure 6) included an increasing amount of "bunching" of isobars in northeast Colorado and western Nebraska, indicating that a strong pressure gradient was developing. Wind speed is directly proportional to the pressure gradient, so a higher pressure gradient will produce stronger winds (see the following link for additional information on pressure gradient and its relationship to wind speed from the National Oceanic and Atmospheric Administration (NOAA): http://www.srh.noaa.gov/jetstream/synoptic/wind.htm). This tightening of the isobars spread southward as a cold front continued to move away from southeast Colorado. By 11 AM MST (18Z, Figure 7) the pressure gradient had become particularly strong between the plains of eastern Colorado and the San Luis Valley of south-central Colorado. This was in response to a building ridge of high pressure in eastern Colorado interacting with an intense low pressure trough extending from north-central New Mexico northward into south-central Colorado.

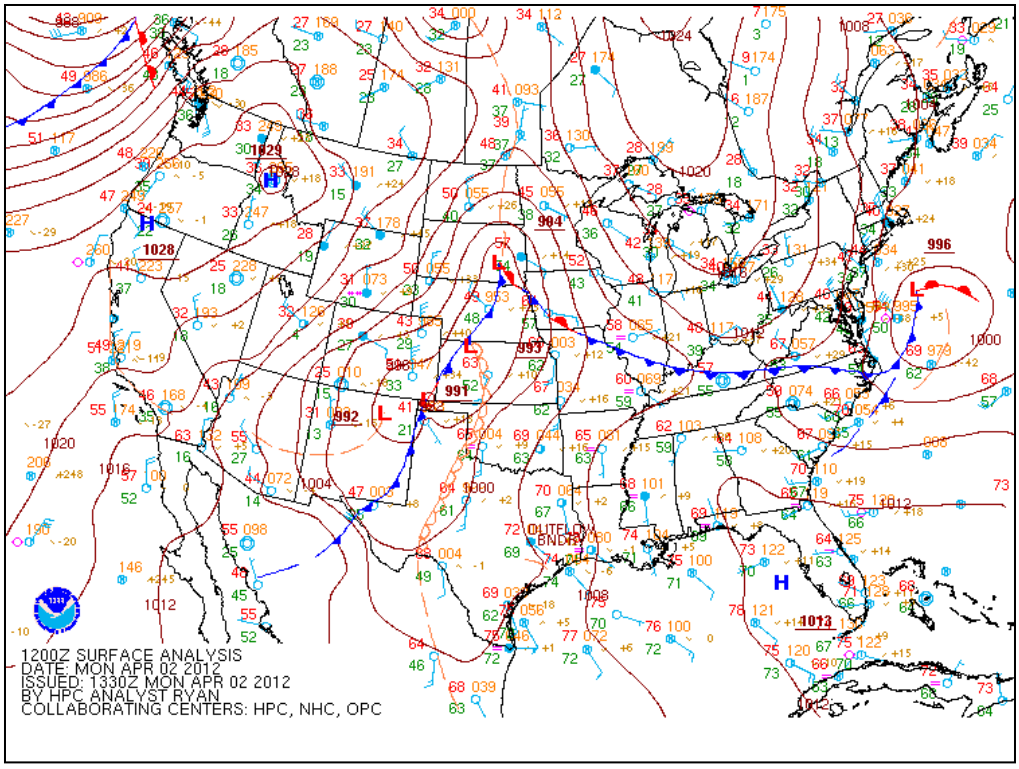

Figure 6: Surface Analysis for 12Z April 2, 2012, or 5 AM MST April 2, 2012. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

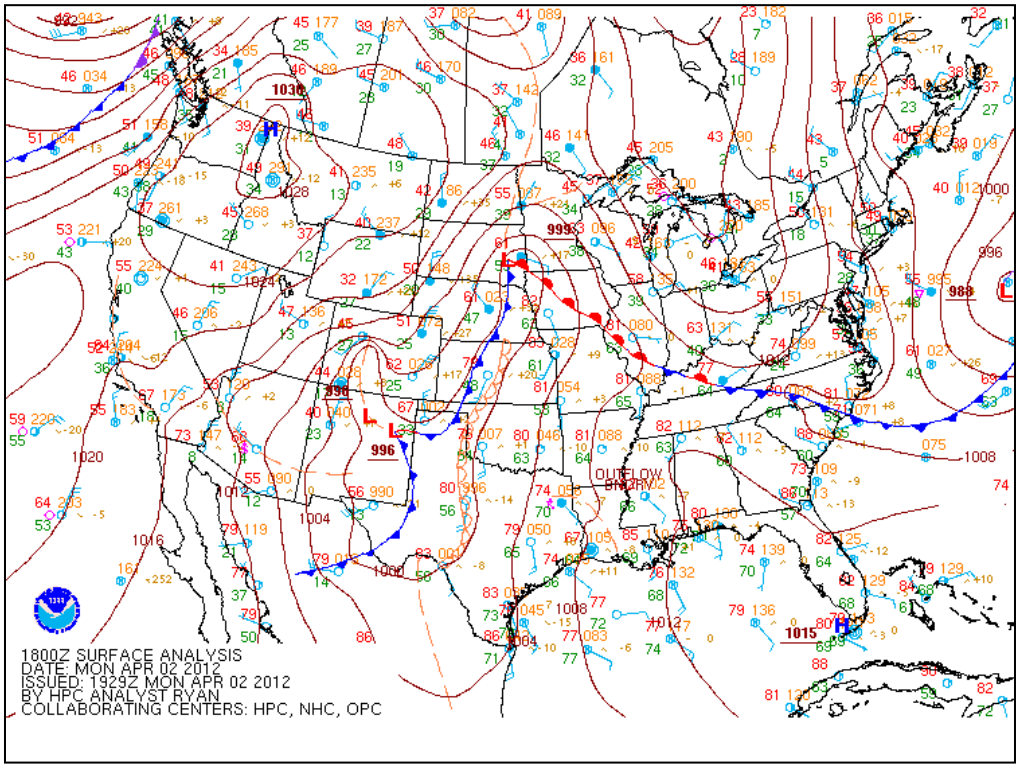

Figure 7: Surface Analysis for 18Z April 2, 2012, or 11 AM MST April 2, 2012. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

In order to fully evaluate the synoptic meteorological scenario of April 2, 2012, hourly surface observations, in table form, were compiled from weather stations in Alamosa and Lamar. In addition, weather conditions from Limon and Pueblo, Colorado along with Scottsbluff, Nebraska are included. Limon and Scottsbluff were located upwind of Lamar on April 2, 2012 while Pueblo was located upwind of Alamosa. These additional observations provide supporting evidence that the dust storm in question was a regional event. Table 1 and Table 2 list observations for the PM_{10} exceedance locations of Alamosa and Lamar, respectively, while Limon, Pueblo and Scottsbluff observations can be found in Table 3, Table 4 and Table 5 respectively. Observations that are climatologically consistent with blowing dust conditions are highlighted in yellow (see Blowing Dust Climatologies available at http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2).

Collectively these weather observation sites experienced many hours of reduced visibility along with sustained wind speeds and gusts at or above the thresholds for blowing dust. Furthermore, an observation of "haze" can be found several times within the Alamosa and Lamar tables. Haze is often reported during dust storms, and in dry and windy conditions haze typically refers to blowing dust (see the following link for the description of haze published by the National Oceanic and Atmospheric Administration (NOAA): http://www.crh.noaa.gov/lmk/?n=general_glossary).

Hourly weather observations show that a regional dust storm occurred in the wake of a strong cold front. These data provide clear evidence of blowing dust and winds well above the threshold speeds for blowing dust on April 2, 2012.

Table 1: Weather observations for Alamosa, Colorado, on April 2, 2012
(Source: http://mesowest.utah.edu/)

Time MST April 2, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
6:52	34	49	5		120		10
7:52	43	55	28	35	100		9
8:52	47	48	22	28	110		10
9:39	46	42	35	46	110	haze	2
9:52	47	42	39	54	100	haze	1.5
10:01	48	40	32	54	100	haze	2.5
10:20	46	42	28	43	100	haze	6
10:47	48	40	38	51	120	haze	2
10:52	47	42	36	51	110	haze	1.75
11:14	46	42	37	48	100	haze	3
11:42	48	40	39	54	120	haze	2
11:52	49	36	41	47	110	haze	2.5
12:17	48	40	37	51	110	haze	3
12:37	48	40	31	46	100	haze	4
12:52	48	39	38	47	110	haze	4
13:12	50	37	33	46	100	haze	5
13:19	48	40	35	46	100	haze	6
13:52	50	34	31	40	100		10
14:52	46	42	36	45	100		7
15:16	46	42	30	45	110	haze	4
15:52	42	55	28	37	110		9
16:30	46	39	16	24	40	haze	6
16:38	46	39	15	24	110		8
16:45	43	52	14	22	130		9
16:52	43	51	10	21	140		10
17:52	43	45	10		230		10
18:52	40	48	16	27	40		8
19:52	39	52	8		210		10
20:52	39	50	9		30		10
21:52	33	69	9		110		10
22:52	33	66	4		220		10
23:52	38	50	18	27	40		10

Table 2: Weather observations for Lamar, Colorado, on April 2, 2012
(Source: http://mesowest.utah.edu/)

Time MST April 2, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	49	33	0				10
1:53	49	33	6		230		10
2:53	47	35	12		200		10
3:53	47	37	9		300		10
4:53	51	56	0				9
5:53	51	54	29	39	360		8
6:32	52	50	35	45	10	haze	3
6:53	52	50	32	44	10	haze	6
7:08	52	50	29	39	10		7
7:53	54	41	24	37	10		9
8:04	54	41	25	36	20		9
8:53	57	34	22	32	10	haze	5
9:18	61	29	21	32	30		10
9:53	62	28	25	36	20		10
10:53	64	28	24	31	30		10
11:53	67	26	27	33	20		10
12:53	68	24	25	38	20		10
13:53	68	24	29	36	10		10
14:53	67	25	27	37	30		10
15:53	65	26	32	38	20		10
16:53	62	27	31	39	20		10
17:53	56	35	31	43	30		10
18:53	51	39	32	41	30		10
19:53	49	44	32	54	30	haze	6
20:53	45	60	35	48	20	lt rain	8
21:53	40	86	21	39	30	mod rain; fog	6
22:53	36	92	23	37	10	lt rain; fog	6
23:53	37	92	35	51	10		10

Table 3: Weather observations for Limon, Colorado, on April 2, 2012
(Source: http://mesowest.utah.edu/)

Time MST April 2, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:43	55	26	17	39	320		10
0:55	52	41	31	43	330		9
1:55	48	56	41	56	330		10
2:55	46	60	32	50	350		10
3:55	42	67	27	40	330		10
4:55	40	73	28	37	320		10
5:55	39	72	24	33	340		10
6:55	41	67	28	39	340		10
7:55	45	53	37	47	350		10
8:55	46	49	35	46	360		10
9:55	48	44	33	46	360		10
10:55	48	44	33	43	350		10
11:55	48	46	33	41	360		10
12:55	50	42	37	46	360		10
13:55	50	42	37	45	360		10
14:55	52	32	36	44	360		10
15:55	48	34	35	46	10		10
16:55	44	40	36	47	10		10
17:55	41	46	33	43	360		10
18:55	39	52	36	47	360		10
19:55	37	64	31	43	350		10
20:19	36	69	30	40	360		10
20:55	36	69	33	43	360		10
21:44	34	86	31	37	350		6
21:55	33	92	25	40	350		5
22:15	34	86	30	40	350		4
22:23	34	86	31	39	350		5
22:46	32	93	27	38	350		4
22:55	33	96	27	36	350		5
23:55	33	96	25	35	350		6

Table 4: Weather observations for Pueblo, Colorado, on April 2, 2012
(Source: http://mesowest.utah.edu/)

Time MST April 2, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	49	18	10		270		10
1:53	50	18	12		270		10
2:51	54	28	31	36	360		10
2:53	54	28	29	37	10		10
3:53	53	43	40	51	10		10
4:53	52	44	45	56	10	haze	5
5:53	50	46	39	56	10		9
6:53	50	43	37	56	10	haze	6
7:53	52	38	44	55	20	haze	6
8:53	50	40	32	48	20		10
9:53	51	41	35	50	20		10
10:53	54	38	39	50	10		7
11:53	53	38	44	50	10		10
12:53	54	37	41	52	20		10
13:34	55	35	41	58	360	haze	3
13:53	52	39	39	54	10		7
14:53	51	41	39	50	10		10
15:53	51	41	39	50	10		10
16:53	47	45	44	54	10		10
17:53	46	45	39	52	360		10
18:53	43	53	38	51	360		10
19:53	42	53	35	48	360		10
20:53	42	53	30	40	10		10
21:53	42	53	41	51	10		10
22:53	41	56	37	53	10	lt rain	10
23:53	39	67	44	55	10	lt rain	10

Table 5: Weather observations for Scottsbluff, Nebraska, on April 1/2, 2012 (Source: http://mesowest.utah.edu/)

Time MST April 1-2, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
21:44	63	27	29	47	30		8
21:53	61	36	28	41	40		8
22:53	58	44	37	47	20		9
23:08	57	44	25	50	10	haze	5
23:53	54	47	15	23	330		10
0:53	53	44	14		330		10
1:53	49	52	13		300		10
2:53	46	53	13		300		10
3:53	48	42	15		310		10
4:53	48	42	18	22	320		10
5:53	46	53	28	43	340		10
6:53	46	53	25	37	330		10
7:53	47	52	27	38	340		10
8:53	48	47	23	32	340		10
9:53	52	39	21	32	350		10
10:53	52	38	25	35	350		10
11:53	51	38	24	32	330		10
12:53	51	33	25	36	10		10
13:53	51	33	23	35	10		10
14:53	50	37	22		10		10
15:53	46	40	25	36	20		10
16:53	45	47	24	32	10		10
17:53	43	55	17	29	10		10
18:53	42	57	18	33	10		10
19:53	42	57	17	25	360		10
20:53	42	55	14		10		10

In order to definitively attribute at least a portion of the dust deposition in Colorado to long-range transport and establish that the April 2, 2012 storm was indeed a regional event, two NOAA HYSPLIT backward trajectory analyses (Draxler and Rolph, 2012) were conducted. The first analysis (Figure 8) is for Lamar and includes 6-hour duration back trajectories initializing at 13Z (6 AM MST) and ending at 16Z (9 AM MST). This encompasses the time period when Lamar was reporting haze and reduced visibility observations (Table 2; also see the following link for more information on HYSPLIT from the NOAA Air Resources Laboratory: http://www.arl.noaa.gov/HYSPLIT_info.php).

The trajectory analysis clearly shows the transport of air from northeast Colorado and the Nebraska panhandle into the Lamar area. Surface weather observations from Limon (Table 3) and Scottsbluff (Table 5) have already shown that high winds, reduced visibility and haze were being reported during the late evening of April 1, 2012 and the early morning of April 2, 2012 directly upwind of the Lamar area. Figure 9 overlays the back trajectories of Figure 8

on a Google Earth image, revealing that at least a portion of the air mass transported into Lamar originated in the near vicinity of both Limon and Scottsbluff.

The NOAA HYSPLIT backward trajectory analysis for Alamosa can be found in Figure 10 with a Google Earth overlay provided in Figure 11. This analysis was also conducted for a back trajectory duration of 6 hours, initializing at 17Z, April 2, 2012 (10 AM MST, April 2, 2012) and concluding at 0Z, April 3, 2012 (5 PM MST, April 2, 2012). This time period encompasses the vast majority of haze and reduced visibility observations for Alamosa. The trajectory analysis reveals a rather typical wind pattern for the San Luis Valley during stormy weather, with mountain pass enhancement of the winds a strong likelihood (see the following link for more information about wind patterns in the San Luis Valley from the National Park Service: http://www.nps.gov/grsa/naturescience/sanddunes.htm). Figure 12 provides a clear visualization of a classic east to northeast wind blowing from the plains of eastern Colorado through Medrano Pass and across the Great Sand Dunes located on the eastern side of the San Luis Valley. This typical wind pattern is in near perfect alignment with the back trajectory analysis of Figure 10. Also note from the analysis in Figure 11 that the back trajectories are in close proximity to the Pueblo area where high winds, haze and reduced visibility were all reported during the morning of April 2, 2012 (Table 4).

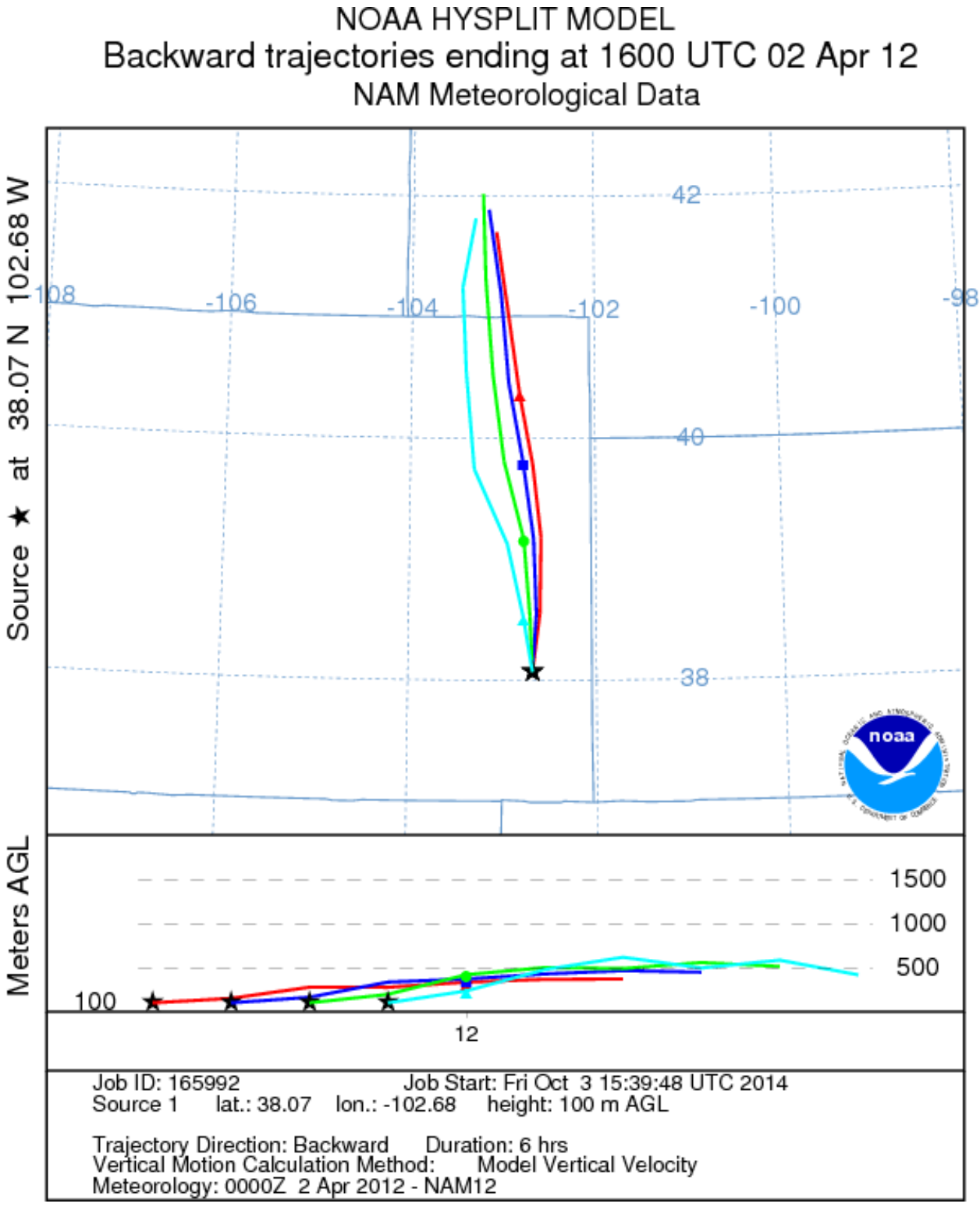

Figure 8: NOAA HYSPLIT NAM 12 6-hour back trajectories for Lamar, CO from 6 AM MST (13Z) April 2, 2012, to 10 AM MST (17Z) November 10, 2012.
(Source: http://ready.arl.noaa.gov/HYSPLIT.php)

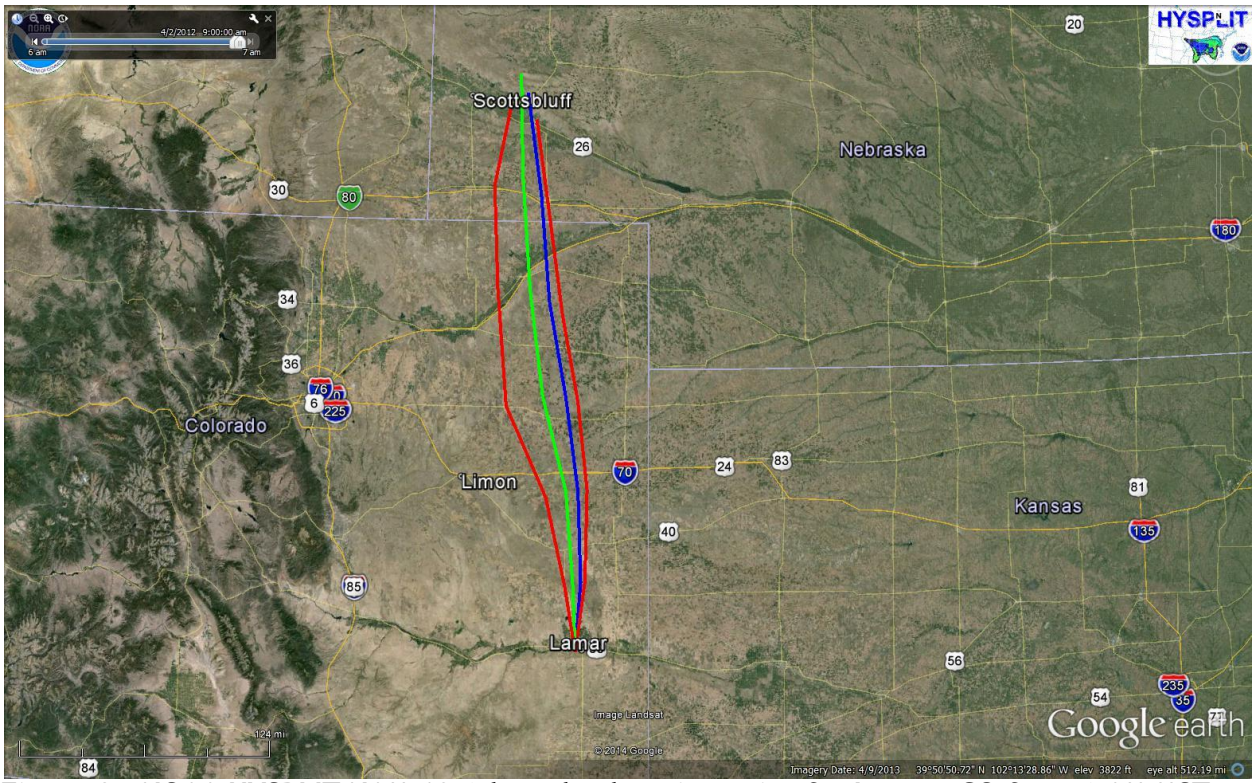

Figure 9: NOAA HYSPLIT NAM 12 6-hour back trajectories for Lamar, CO from 6 AM MST (13Z) April 2, 2012, to 10 AM MST (17Z) April 2, 2012, overlain on Google Earth. (Source: http://ready.arl.noaa.gov/HYSPLIT.php)

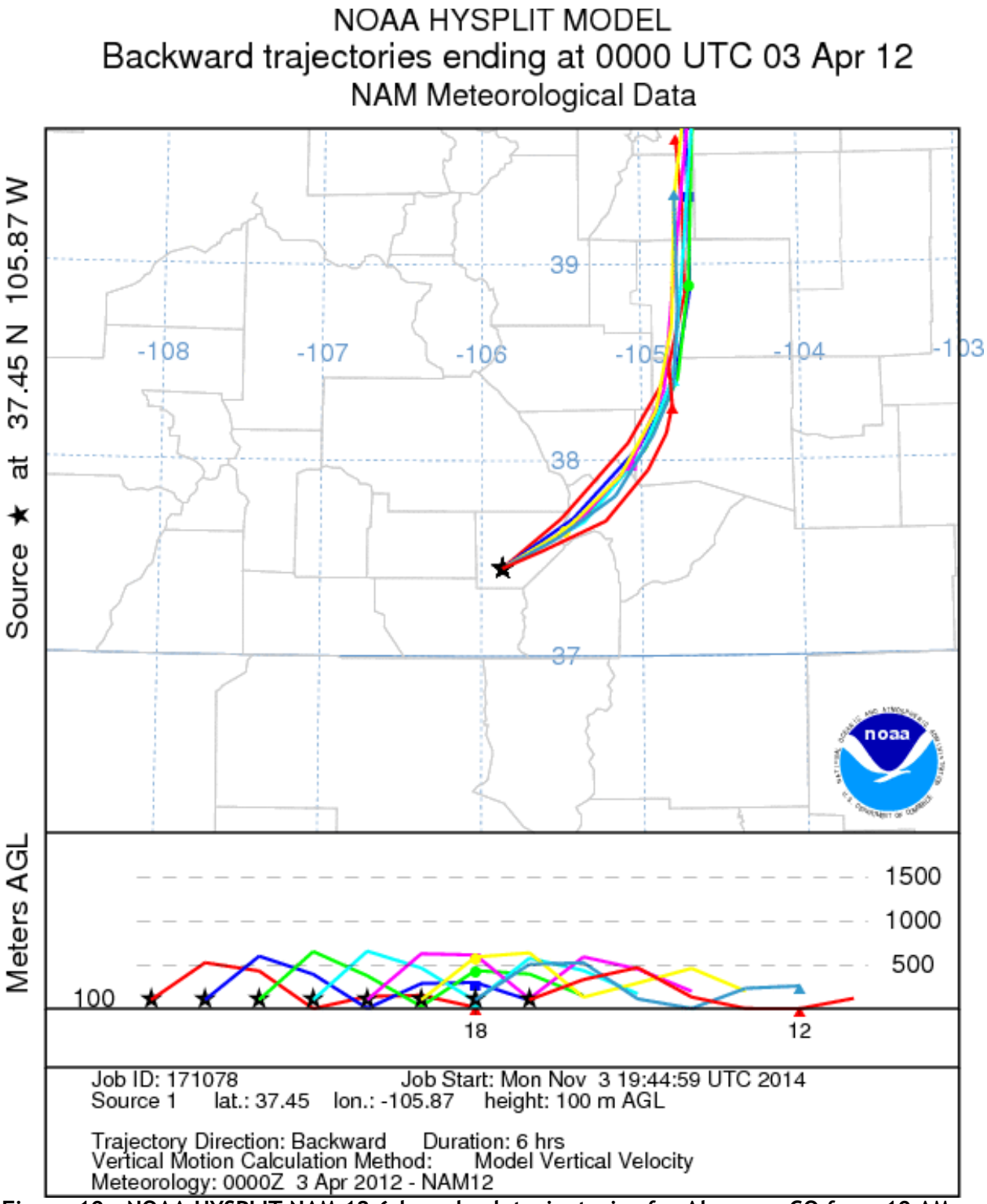

Figure 10: NOAA HYSPLIT NAM 12 6-hour back trajectories for Alamosa, CO from 10 AM MST (17Z) April 2, 2012, to 5 PM MST (0Z, April 3) April 2, 2012.
(Source: http://ready.arl.noaa.gov/HYSPLIT.php)

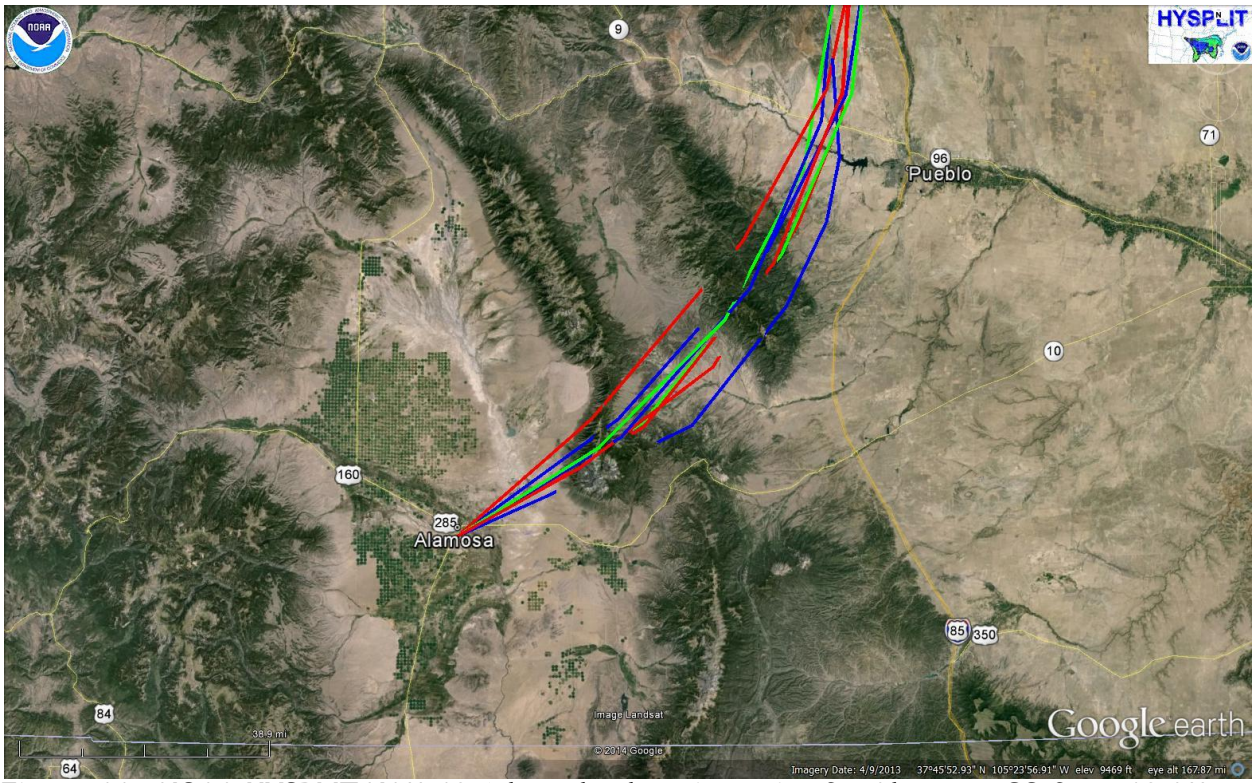

Figure 11: NOAA HYSPLIT NAM 12 6-hour back trajectories for Alamosa, CO from 10 AM MST (17Z) April 2, 2012, to 5 PM MST (0Z, April 3) April 2, 2012, overlain on Google Earth. (Source: http://ready.arl.noaa.gov/HYSPLIT.php)

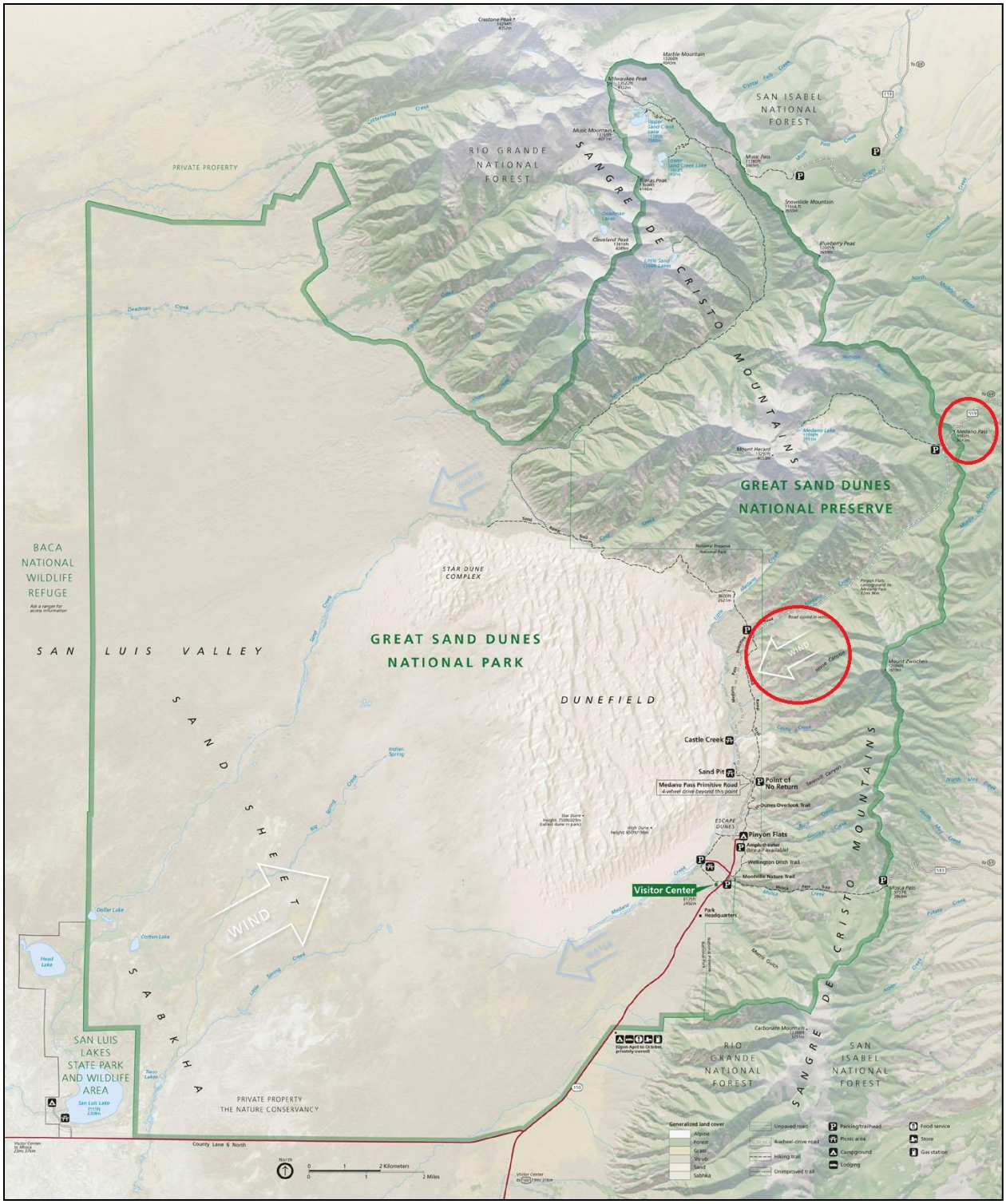

Figure 12: Great Sand Dunes National Park Map.
(Source: http://www.coloradoswildareas.com/great-sand-dunes-national-park/)

Satellite imagery provides strong supporting evidence that a regional dust storm was taking place on April 2, 2012. Specifically, the GOES visible satellite image at 7:45 AM MST (1345Z) zoomed on southeast Colorado (Figure 13) reveals a distinctive dust plume only a few miles to the west of Pueblo. This dust plume (circled in red) is aligned in a north-northeast to south-southwest direction. This is consistent with the prevalent wind direction of 20° (north-northeast) at around the same time in Pueblo (Table 4, 7:53 AM MST). Also note from Table 4 at 7:53 AM MST (8 minutes after the satellite image), the weather observation from Pueblo included sustained winds of 44mph, gusts to 55mph with haze and a reduced visibility of 6 statute miles. This is an observation that is consistent with blowing dust conditions in southeast Colorado (s see Blowing Dust Climatologies available at http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2) and is in alignment with the satellite image of Figure 13.

Visible satellite imagery from April 2, 2012 clearly reveals that a dust storm was taking place in parts of southeast Colorado other than Alamosa or Lamar, signifying that this was a regional event and therefore not controllable or preventable.

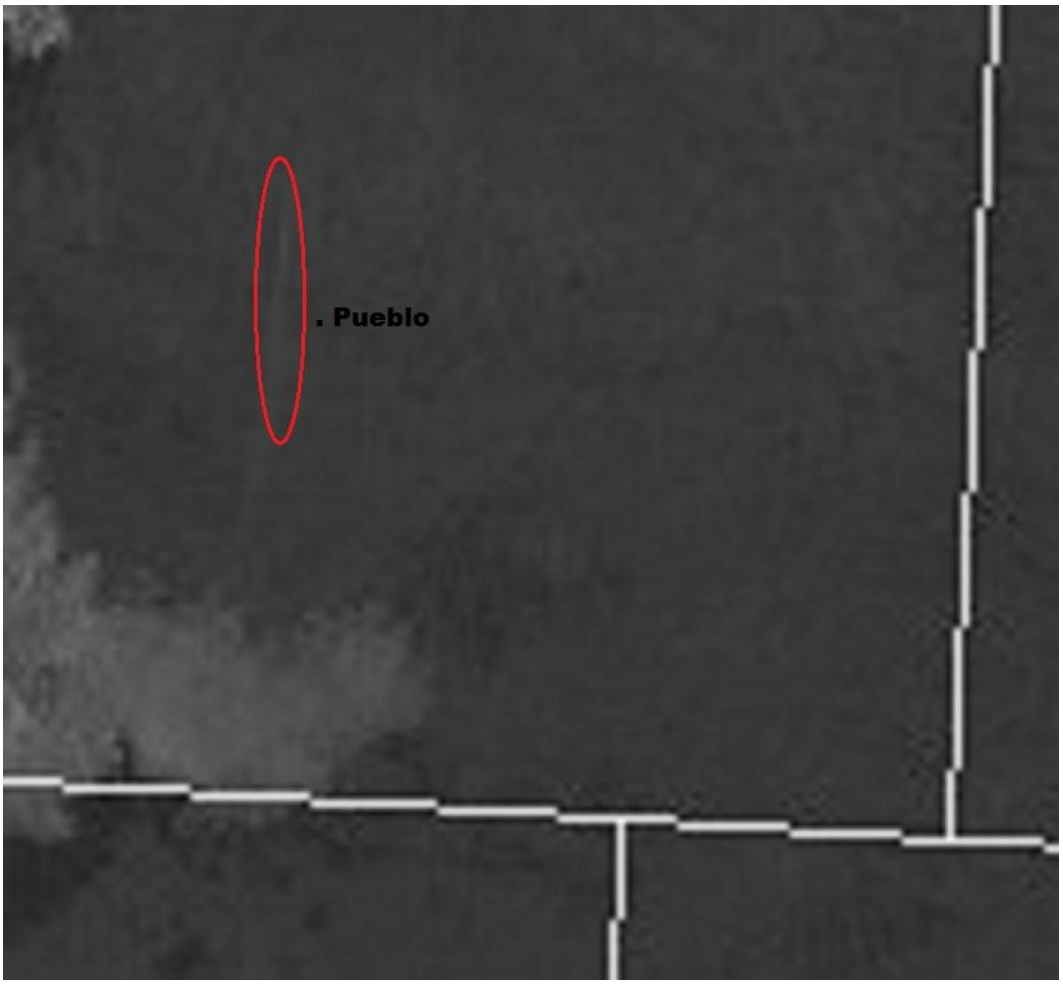

Figure 13: GOES visible satellite image of southeast Colorado at 7:45 AM MST (1345Z) April 2, 2012.
(Source: http://www.mmm.ucar.edu/imagearchive/)

In addition to post-frontal winds, thunderstorm downburst winds were also likely a contributor to the PM_{10} exceedance in Lamar on April 2, 2012. Thunderstorms were predicted for southwest Kansas, and the Storm Prediction Center (SPC) issued a Severe Thunderstorm Watch from 2:40 PM to 10:00 PM CST (Figure 14). Included in the text of this watch is, "The expectation is that very large hail and damaging wind gusts will be the primary hazards." and "Thunderstorm wind gusts to 70mph." (Source: http://www.spc.noaa.gov/products/watch/2012/ww0129.html).

By 025Z, April 3, 2012(5:25 PM MST, April 2, 2012), strong to severe thunderstorms had erupted across southwest Kansas (Figure 15). These storms can be observed to have a bow echo pattern. When bands of showers and thunderstorms "bow out" they are often associated with strong, sometime damaging, winds that spread outward from the bottom of the storms (for additional information on bow echoes from the SPC: http://www.spc.noaa.gov/misc/AbtDerechos/bowechoprot.htm).

At approximately 251Z, April 3, 2012 (7:51 MST, April 2, 2012), outflow winds from the thunderstorms in southwest Kansas arrived in Lamar. Figure 16 shows the Base Reflectivity image of southeast Colorado at this time from the Pueblo radar. The 0.50° elevation angle product was used in order to capture hydrometeors closest to the earth's surface. The image reveals radar returns in Lamar and other parts of Prowers County in the 20-40dBZ range. Referring back to Lamar surface observations at the time (Table 2, 1953 MST) reveals that no rain was being reported. However, the observation does include sustained winds of 32mph, gusts to 54mph with haze and visibility reduced to 6 statute miles. Once again we find an observation consistent with blowing dust conditions in southeast Colorado (see Blowing Dust Climatologies available at http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2). Therefore, it is reasonable to assume that the radar returns captured in Figure consisted primarily of dust particles.

NEXRAD imagery indicates that an additional period of dust deposition occurred in Lamar during the evening hours of April 2, 2012 and likely contributed to the PM_{10} exceedance at the Municipal Building monitor.

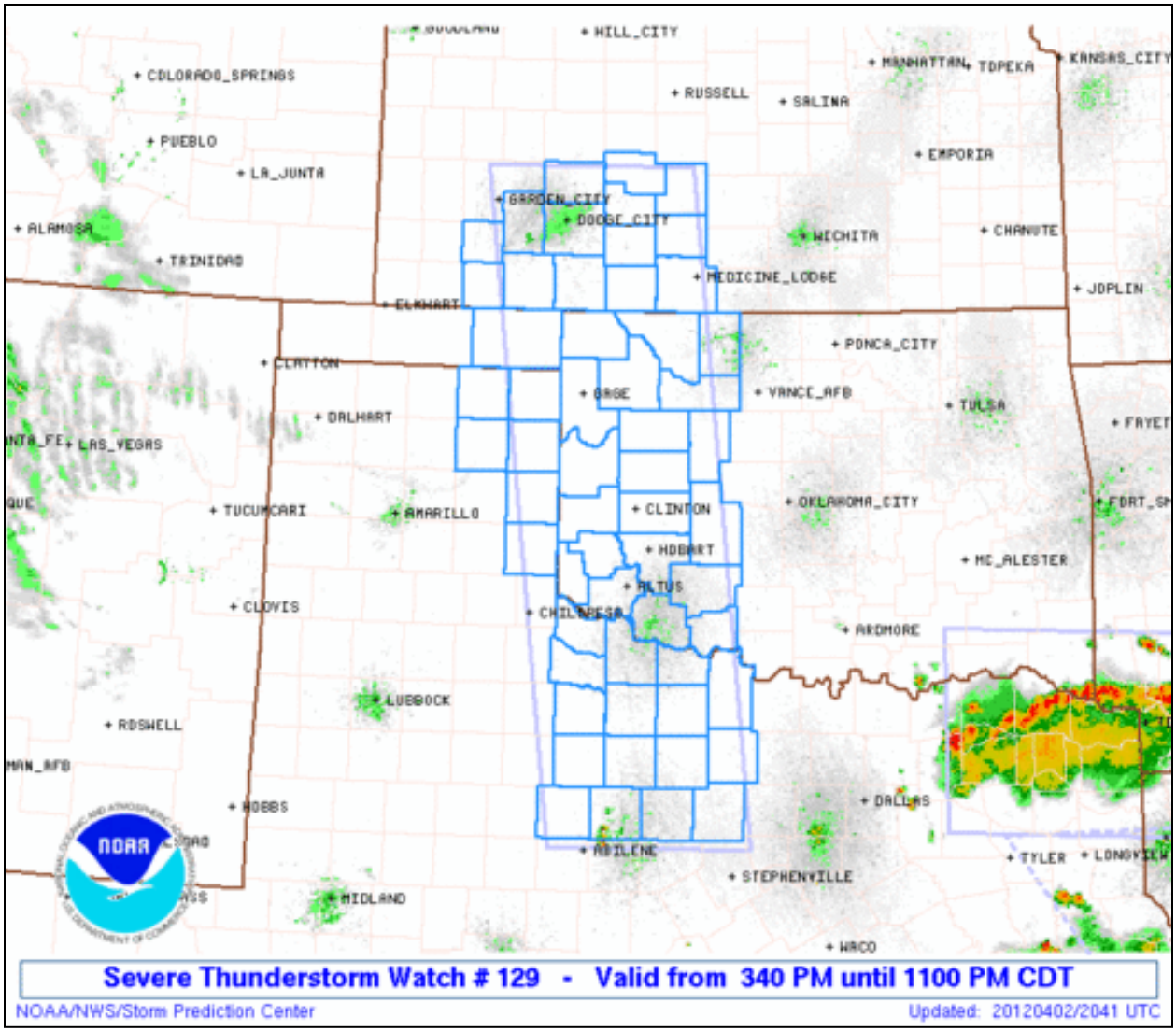

Figure 14: Severe Thunderstorm Watch #129 issued by the Storm Prediction Center, April 2, 2012.
(Source: http://www.spc.noaa.gov/products/watch/2012/ww0129.html)

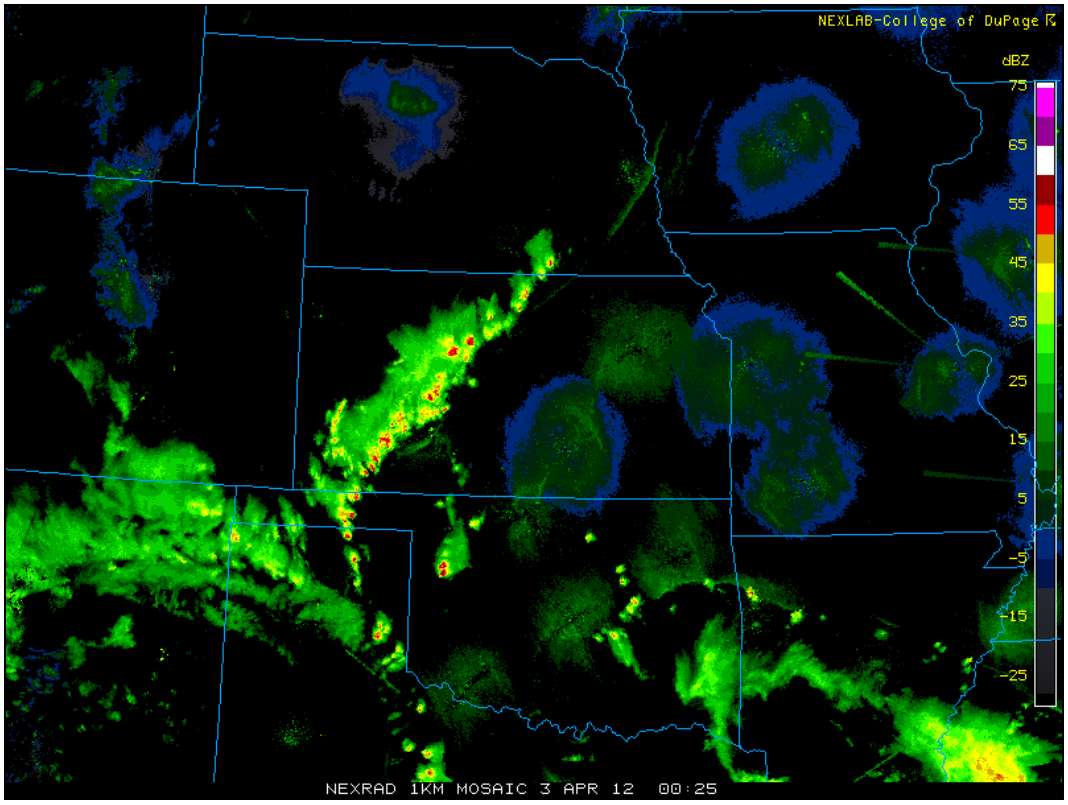

Figure 15: NEXRAD 1 km mosaic at 5:25 PM MST (025Z, April 3), April 2, 2012. (Source: http://www.mmm.ucar.edu/imagearchive/)

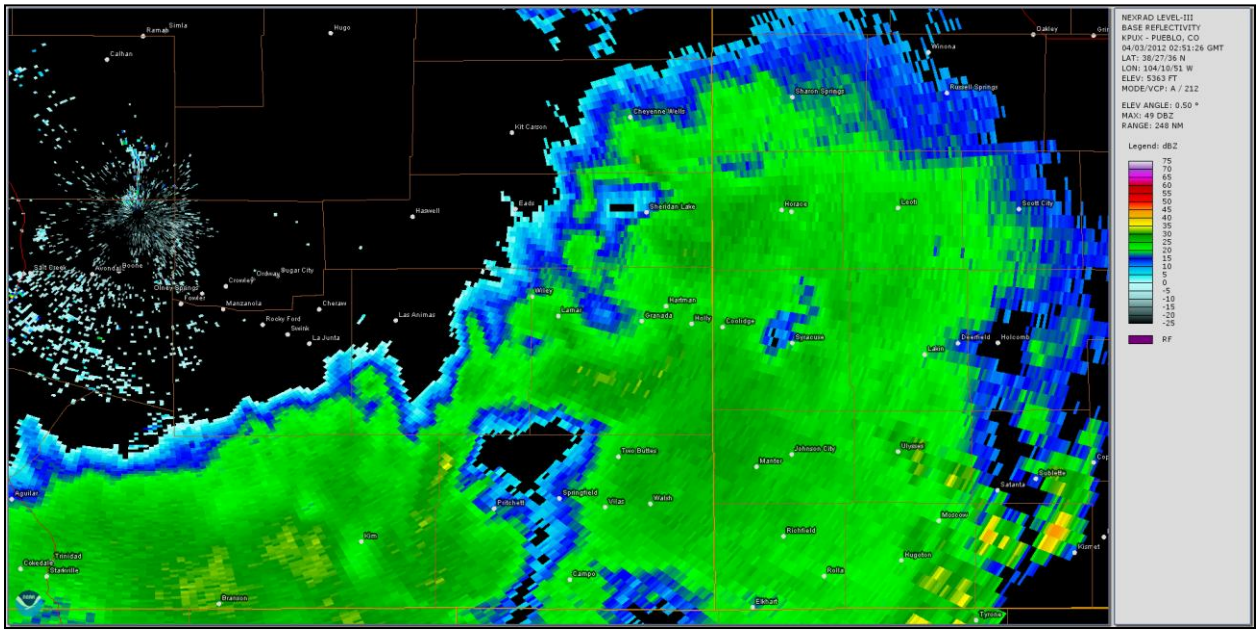

Figure 16: NEXRAD Base Reflectivity image, 0.50º elevation angle, from the Pueblo, CO radar at 7:51 PM MST (251Z, April 3), April 2, 2012. (Source: http://www.ncdc.noaa.gov/nexradinv/)

Figure 17 and Figure 18 show the total precipitation in inches for March, 2012 for Colorado and Nebraska, respectively. With the exception of a few locations along the Kansas state line, areas from Lamar northward along the back trajectory analysis of Figure 8 into western Nebraska received less than 0.5 inches of precipitation during the 30-day period leading up to the April 2, 2012 dust event in Lamar (note: no measureable precipitation was observed on April 1 in eastern Colorado or western Nebraska -- source: http://water.weather.gov/precip/). Similar soil moisture conditions were observed around the Alamosa area along with locations upwind to the east and northeast into eastern Colorado, where 0.5 inches or less of precipitation fell during the previous 30 days. Based on previous research 0.5 to 0.6 inches of precipitation over a 30-day period has been found to be the approximate threshold, below which, blowing dust exceedances in Colorado are more likely to occur when combined with high winds (see Blowing Dust Climatologies available at http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2).

30-day precipitation totals indicate that soils in the San Luis Valley of south-central Colorado and the plains of eastern Colorado and western Nebraska were dry enough to produce blowing dust when winds were above the thresholds for blowing dust.

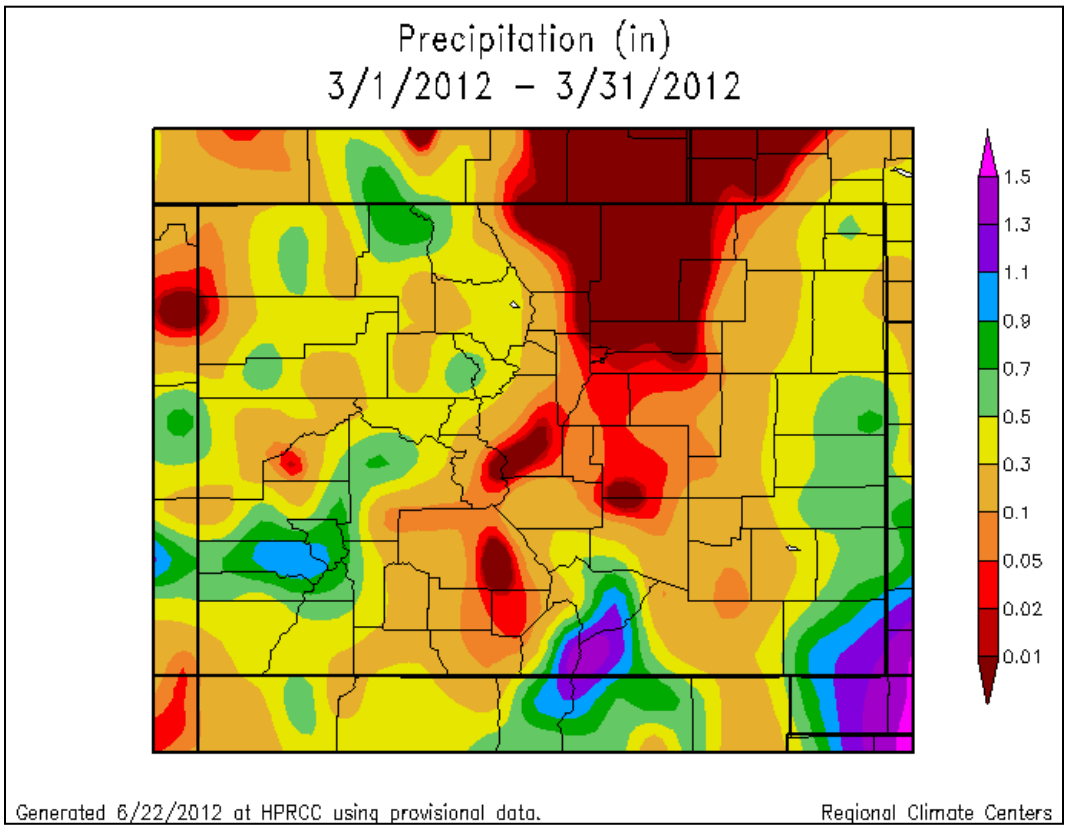

Figure 17: Total precipitation in inches for Colorado, March 2012. (Source: http://www.hprcc.unl.edu/maps/current/)

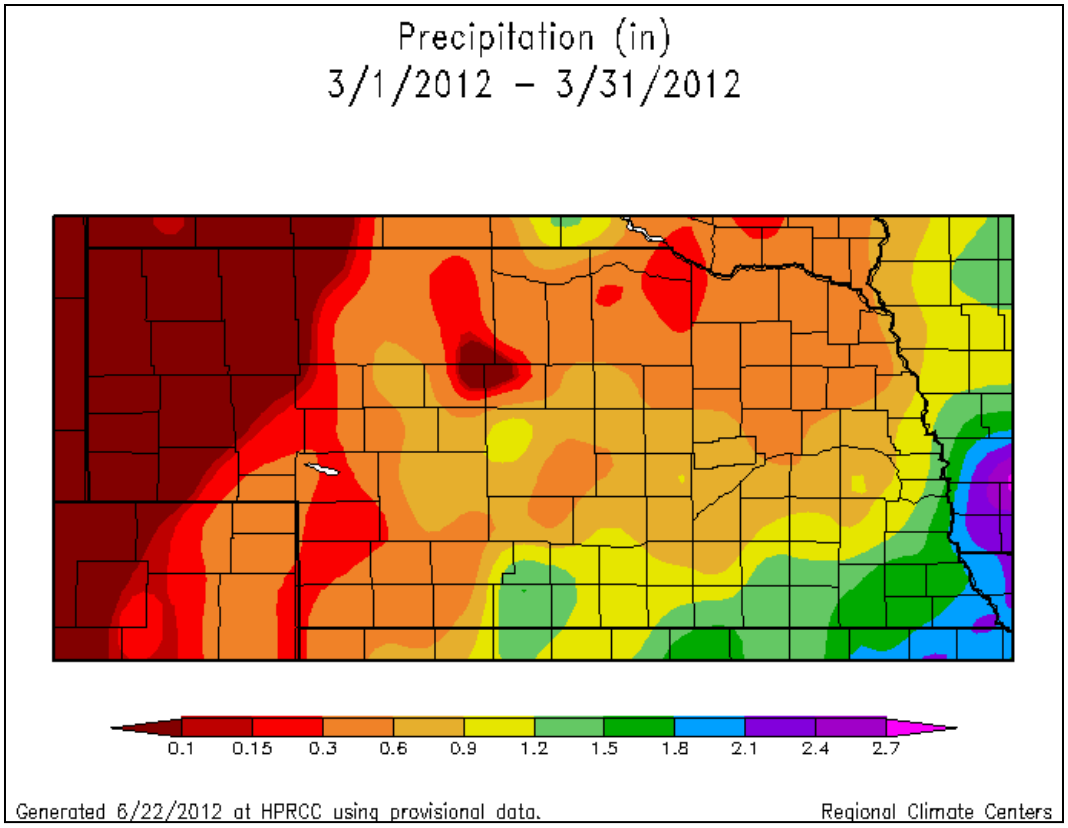

Figure 18: Total precipitation in inches for Nebraska, March 2012. (Source: http://www.hprcc.unl.edu/maps/current/)

The Denver and Pueblo National Weather Service (NWS) forecast offices issue weather information and alerts for all of south-central and eastern Colorado, including Alamosa and Lamar. The NWS office in Cheyenne, Wyoming monitors the Nebraska Panhandle, a suspected source area that contributed to the blowing dust in eastern Colorado on April 2, 2012. Appendix B provides several warnings, advisories and discussions from the Denver, Pueblo and Cheyenne NWS offices for April 1, 2012 to April 2, 2012. The text from these products, particularly those highlighted in yellow, clearly show that the NWS anticipated high winds and blowing dust. Additionally, the Colorado Department of Public Health and Environment (CDPHE) issued a Blowing Dust Advisory for portions of eastern Colorado and the San Luis Valley on April 2, 2012. That advisory can also be found in Appendix A.

The Smoke Text Product from the National Oceanic and Atmospheric Administration (NOAA) Satellite Services Division – Descriptive Text Narrative for Smoke/Dust Observed in Satellite Imagery mentions blowing dust in two consecutive products at 9:30 AM and 6:15 PM MST, April 2, 2012. Those narratives can also be found in Appendix A and reveal that NOAA believed blowing dust was occurring in southeast and south-central Colorado on April 2, 2012.

Text products and advisories issued by the NWS, CDPHE and NOAA show that very strong winds and areas of blowing dust were anticipated and did occur in south-central and southeast Colorado on April 2, 2012.

3.0 Evidence-Ambient Air Monitoring Data and Statistics

On April 2, 2012, an intense cold front moved across Southern Colorado. Strong and gusty northerly post-frontal winds transported blowing dust into Lamar from western Nebraska and eastern Colorado. In Alamosa, post-frontal winds were also strong but were from an east to southeast direction. These winds transported dust into Alamosa from the eastern side of the San Luis Valley. Additional dust likely arrived in Alamosa from the eastern plains via Medano and Mosca Passes. The strong winds generated from the cold front's passing affected PM_{10} samples across a broad geographical area. During this event samples in excess of 150 $\mu g/m^3$ were recorded at Alamosa Adams State College (Alamosa ASC, 389 $\mu g/m^3$) and Lamar Municipal (Lamar Muni, 163 $\mu g/m^3$). An elevated sample was recorded at the Lamar Power Plant monitoring site (Lamar Power, 147 $\mu g/m^3$). No other samples were affected by this event.

3.1 Historical Fluctuations of PM_{10} Concentrations in Alamosa and Lamar

This evaluation of PM_{10} monitoring data for sites affected by the April 2, 2012, event was made using valid samples from PM_{10} samplers in Alamosa and Lamar from 2008 through 2012. APCD has been monitoring PM_{10} concentrations in these areas since 1985. The overall data summary for the affected sites is presented in Table 6, with all data values being presented in $\mu g/m^3$:

Table 6: April 2, 2012, Event Data Summary

Evaluation	*Alamosa ASC*	*Lamar Power*	*Lamar Muni*
4/2/2012	**389**	**147**	**163**
Mean	23.5	28.4	21.8
Median	19	24	19
Mode	13	19	15
St. Dev	26.1	22.2	16.2
Var	683.7	495.1	261.7
Minimum	1	3	1
Maximum	440	367	242
Count	1634	1818	1759

The approximate percentile values for various criteria were calculated and are displayed in Table 7. All percentile calculations presented in this table were made using the entire dataset, including known high wind events. There is no difference between the two datasets for any site (with and without high wind events) in regards to percentile calculations. Percentile calculations for the entire dataset ('Overall'), for samples taken in any April ('Any April'), and for any sample in 2012 for all sites affected by the event are presented in Table 7.

Table 7: April 3, 2012 Site Percentile (All Affected Sites)

Evaluation	*Alamosa ASC*	*Lamar Power*	*Lamar Muni*
4/2/2012	**389**	**147**	**163**
Overall	99.9%	99.4%	99.8%
Any April	*Max Value*	*99.8%*	*Max Value*
2012	Max Value	99.2%	99.7%

The percentile calculations in Table 7 demonstrate the extreme nature of these samples as compared with each dataset. Although the Lamar Power sample is not in excess of 150µg/m^3 it still exceeds the 99th percentile sample recorded among all April samples from 2008 through 2012 and exceeds the 99th percentile value of all samples in 2012. That all samples from affected sites are representative of extreme values for their independent data sets suggests that there was a common contribution to each sample from other than local sources.

The data set for the four sites are further summarized by month. As with previous submittals these summaries the data presents no obvious 'season'; PM_{10} levels at any particular site in Colorado do not necessarily fluctuate by season. Of greater importance affecting day-to-day, typical PM_{10} concentrations are local sources, e.g. road sanding and sweeping, local burning from agriculture and residential heating, vehicle contributions via road dust, unpaved lots or roads, etc. While the historic monthly mean values for the affected sites can be higher during the winter and spring months there is little month-to-month variation. Additionally, some of the sites exhibit monthly medians from these periods (winter and spring) that are generally lower than other months of the year. This time frame (winter and spring) is that which is most likely to experience the meteorological and dry soil conditions necessary for this type of event and are discussed elsewhere in this document. Although the maximum values for these months (winter and early spring) are the highest in the data set the 'typical' data (i.e. day-to-day, reflective of local conditions) are similar or lower than the same 'typical' data for the rest of the year. The summary data for the month of April (all samples in any April from 2008-2012) and for 2012 for all three sites are presented in Table 8**:**

Table 8: April 2, 2012 PM_{10} Evaluation by Month and Year

Evaluation	*Alamosa ASC*		*Lamar Power*		*Lamar Muni*	
	April	All 2012	April	All 2012	April	All 2012
Mean	32.2	26.9	29.0	28.1	21.7	24.6
Median	19	20	22	24	17	20
Mode	11	13	18	27	14	17
St. Dev.	50.2	33.0	25.5	23.1	20.0	21.4
Var.	2518.6	1087.8	648.6	532.7	399.4	460.1
Minimum	1	5	4	3	3	3
Maximum	389	389	169	220	163	242
Count	145	357	149	361	141	364

Alamosa ASC – 080030001

The PM_{10} sample on April 2, 2012, at Alamosa ASC of 389 µg/m^3 is the largest sample recorded among all April samples from 2008 through 2012, is the largest sample of all 2012

data, and is greater than the 99th percentile value (104 µg/m^3) for the entire dataset. Overall, this sample is the 2nd largest sample in the entire data set. There are 1,634 samples in the Alamosa ASC dataset. The sample of April 02, 2012 clearly exceeds the typical samples for this site.

Figure 19 through Figure 26 graphically characterize the Alamosa ASC PM_{10} data. The first, Figure 19, is a simple time series; every sample in this dataset (2008 – 2012) greater than 150 µg/m^3 is identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 µg/m^3 (there are 19). Of the 1,634 samples in this data set only slightly more than 1% are greater than 100 µg/m^3.

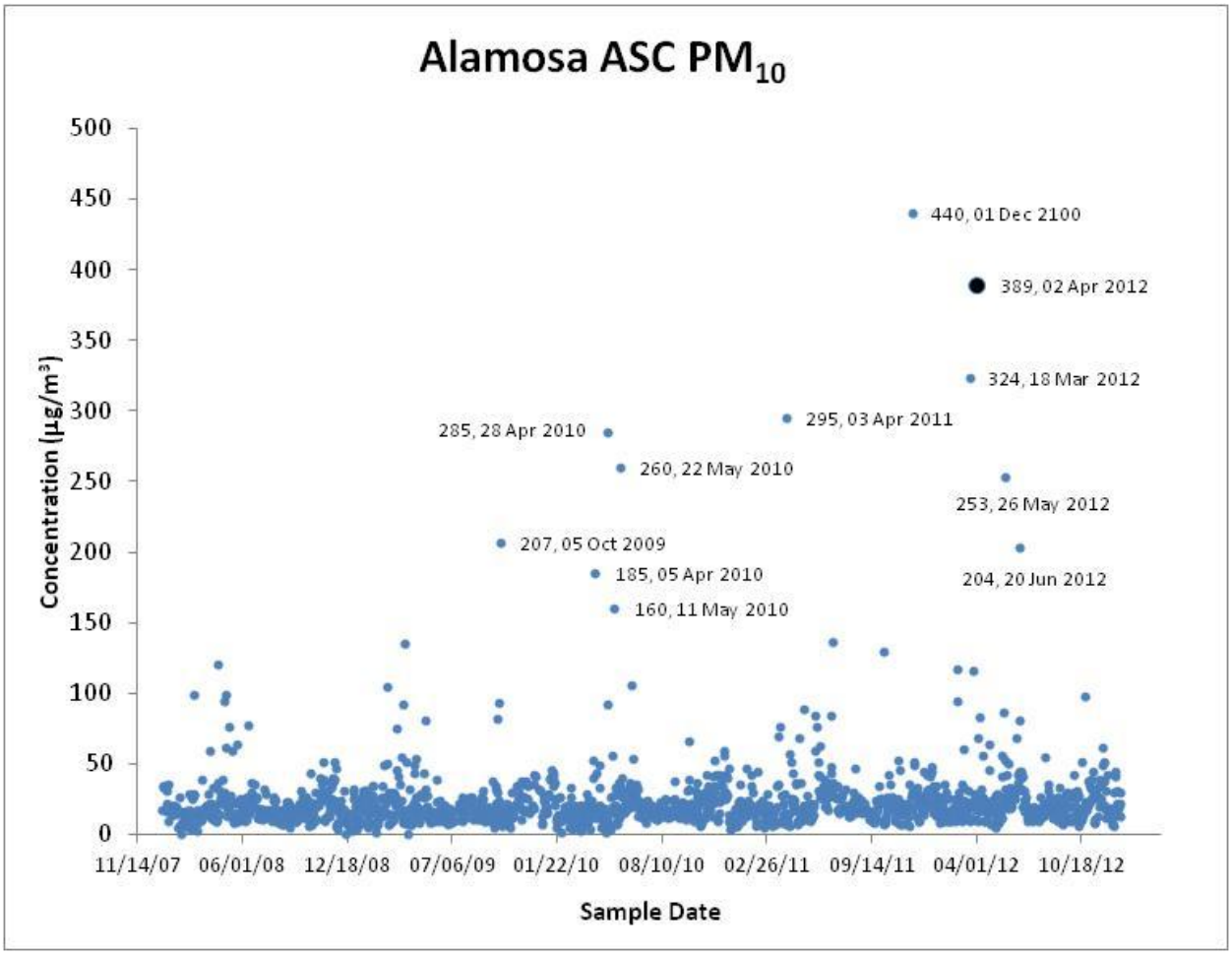

Figure 19: Alamosa Adams State College PM_{10} Time Series, 2008-2012

Figure 20 is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. This range of data can be considered typical, representing contributions from local sources. Well over 80% of the samples in this data set are less than 30 µg/m^3. Even in the highly variable months comprising winter and early spring over 90% of the samples are less than 50 µg/m^3. Clearly the sample of April 02, 2012, exceeds what is typical for this site.

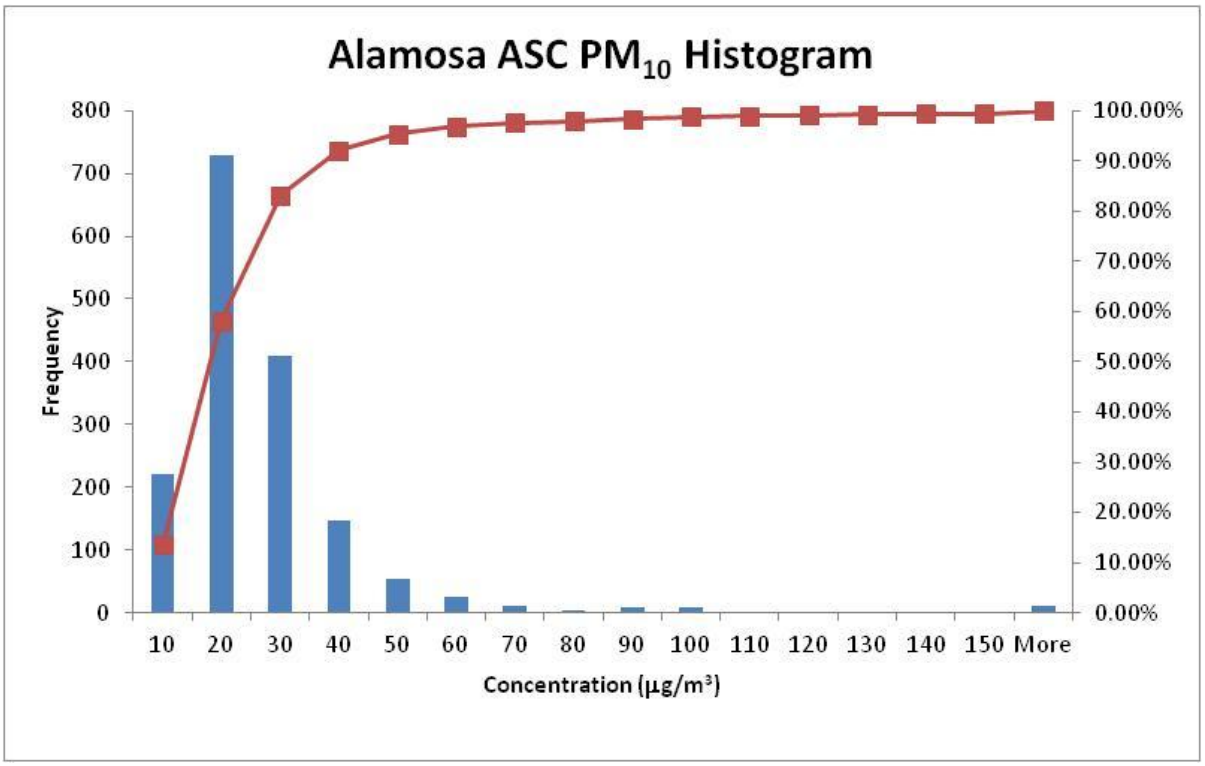

Figure 20: Alamosa Adams State College PM_{10} Histogram, 2008-2012

The monthly box-whisker plot (Figure 21), highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 02, 2012. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

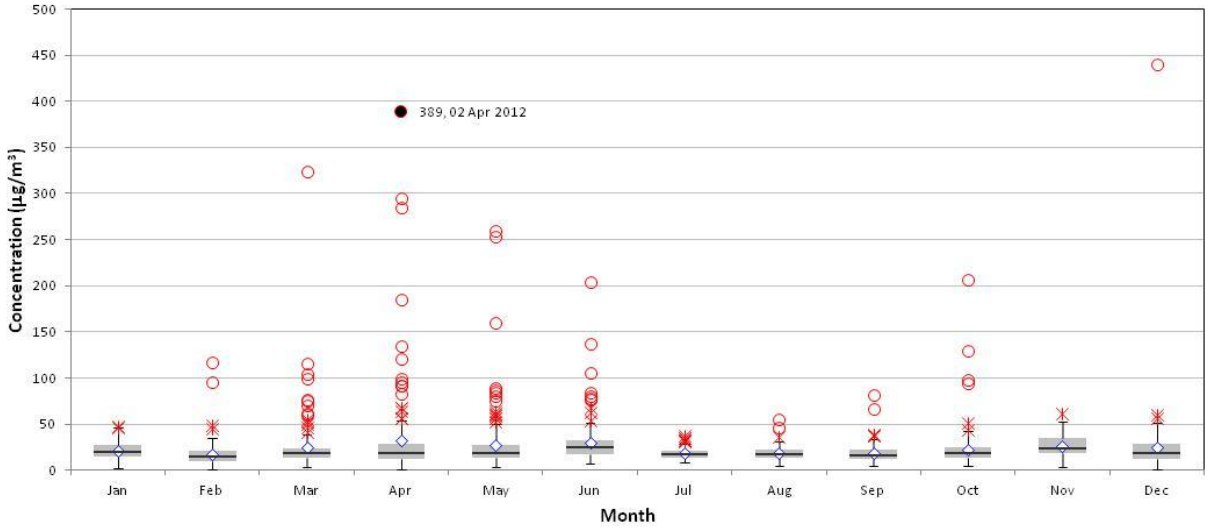

Figure 21: Alamosa Adams State College PM_{10} Box-Whisker Plot, 2008-2012

The box-whisper plots graphically represent the overall distribution of each data set including the mean (◇), the inner quartile range (▮ IQR, defined to be the distance between the 75th% and 25th%), the median (represented by the horizontal black line) and two types of outliers identifed in these plots: outliers greater than 75th% +1.5*IQR (✳)and outliers greater than 75th% + 3*IQR (○).

The presence of the extreme values distorts the graph, losing definition and distorting information presented across the small portion of the range where the majority of data resides. The same plot graphed to 100µg/m^3, which includes almost 99% of all the data, is presented in Figure 22. This expanded plot demonstrates that April is a month where contributions from local sources (the median) are similar to other months of the year but with a broad interquartile range – indicating a large amount of variation due to a small number of extreme samples.

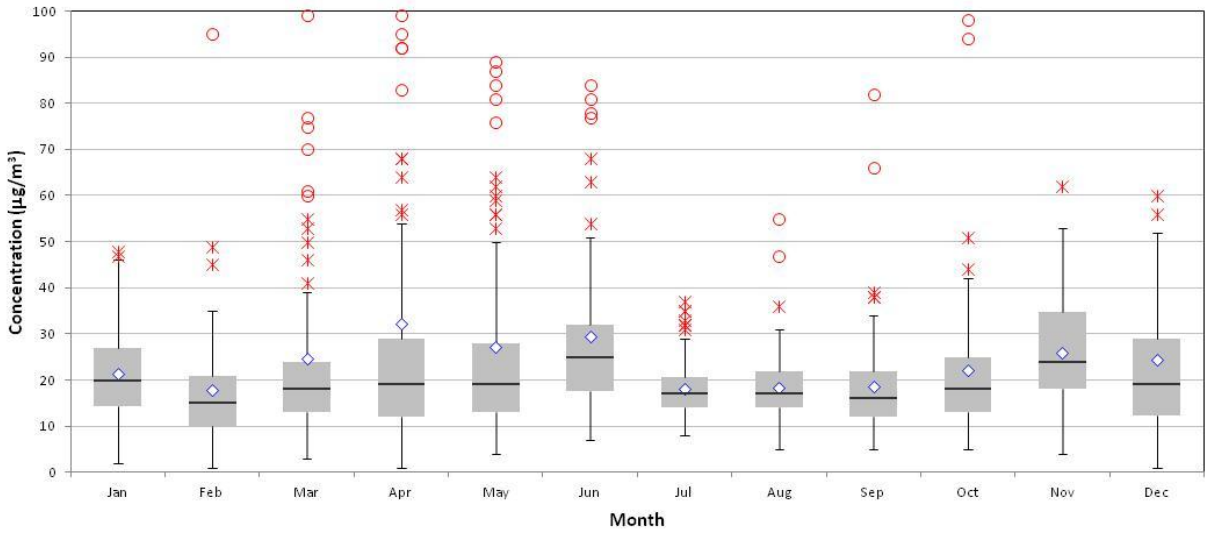

Figure 22: Alamosa Adams State College PM_{10} Box-Whisker Plot, Reduced Scale, 2008-2012

Note the degree to which the data in the months of fall through spring, beginning in October and extending through May, are skewed. The April mean (32.2µg/m^3) is greater than the April median value (19µg/m^3) and is greater than 75% of all samples in any April. The skew in the data is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. This data exposes that perception as flawed, typical data subject to local sources of variation are similar to every other month of the year. Figure 22 suggests that typical, day to day PM_{10} concentrations exposures for the month of June and November are highest among all months. The sample of April 02, 2012, clearly exceeds the typical data at this site.

Lamar Muni – 080990002

The PM_{10} sample on April 2, 2012, at Lamar Muni of 163 µg/m^3 is the largest sample recorded among all April samples from 2008 through 2012, is the 2nd largest sample of all 2012 data, and is greater than the 99th percentile value (93 µg/m^3) for the entire dataset. Overall, this sample is the 4th largest sample in the entire data set. All three samples greater than the

event sample are associated with a high wind event, there are 1,759 samples in the Lamar Muni dataset. The sample of April 02, 2012 clearly exceeds the typical samples for this site.

Figure 23 through Figure 26 graphically characterize the Lamar Muni PM_{10} data. The first, Figure 23, is a simple time series; every sample in this dataset (2008 – 2012) greater than 150 $\mu g/m^3$ is identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than 100 $\mu g/m^3$. Of the 1,759 samples in this data set less than 1% are greater than 100 $\mu g/m^3$.

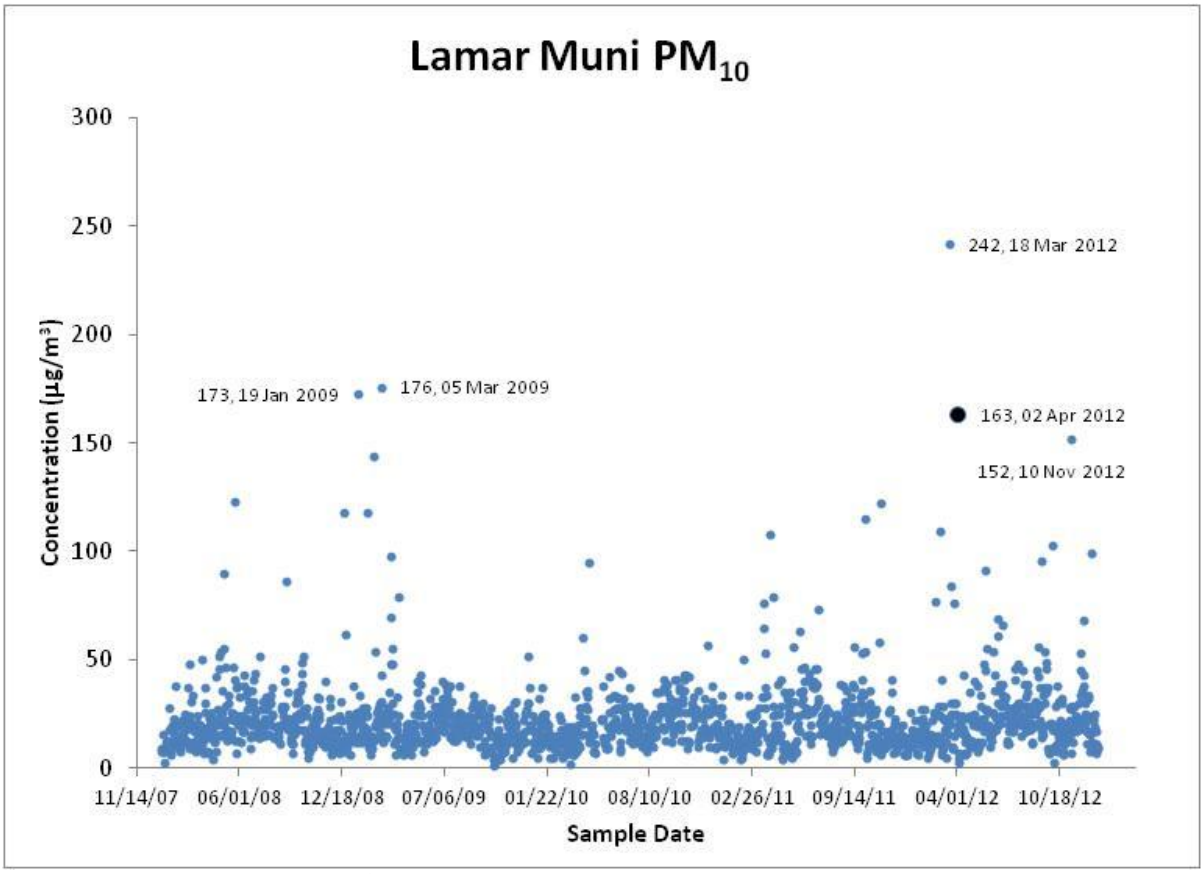

Figure 23: Lamar Municipal PM_{10} Time Series, 2008-2012

Figure 24, is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. This range of data can be considered typical, representing contributions from local sources. Almost 85% of the samples in this data set are less than 30 $\mu g/m^3$. Even in the highly variable months comprising winter and early spring over 90% of the samples are less than 50 $\mu g/m^3$. Clearly the sample of April 02, 2012, exceeds what is typical for this site.

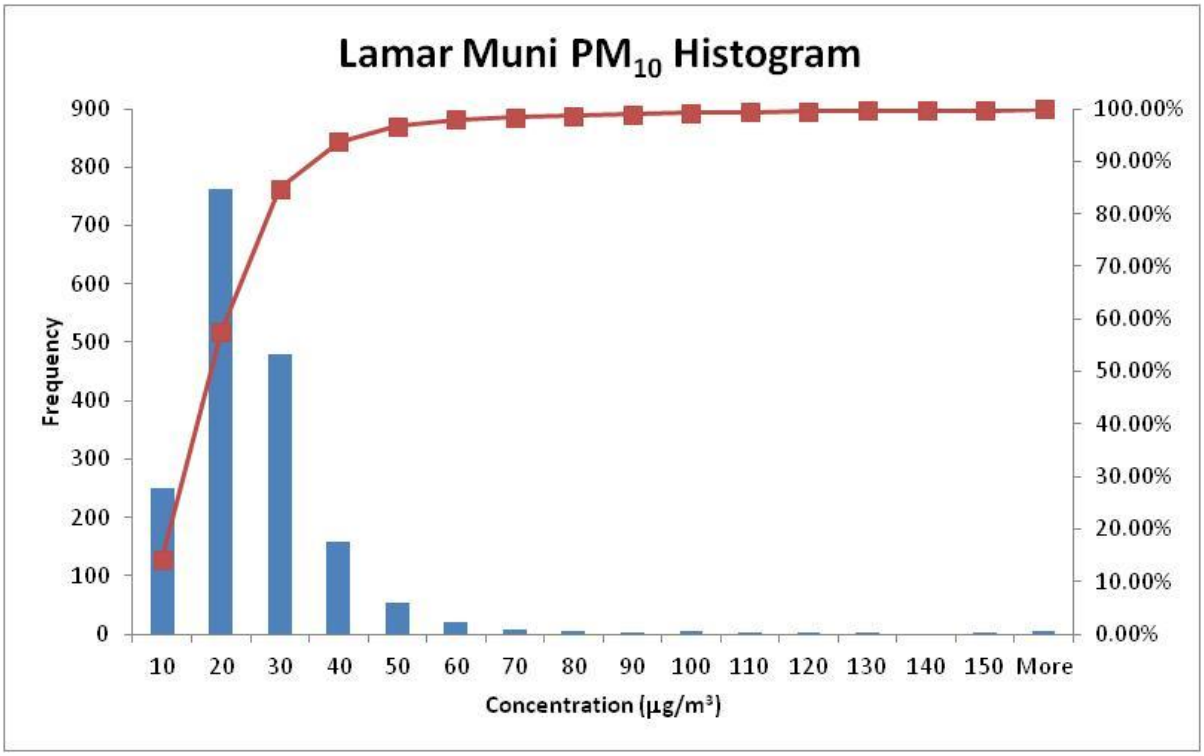

Figure 24: Lamar Municipal PM_{10} Histogram, 2008-2012

The monthly box-whisker plot (Figure 25), highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 02, 2012. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

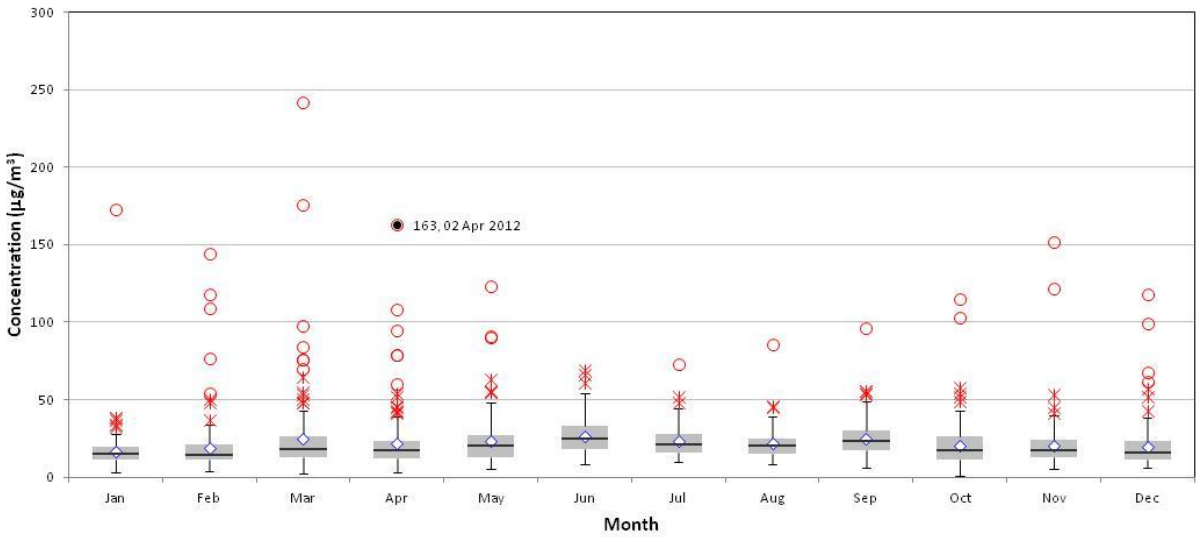

Figure 25: Lamar Muni PM_{10} Box-Whisker Plot, 2008-2012

The presence of the extreme values distorts the graph, losing definition and distorting information presented across the range where the majority of data resides. The same plot graphed to 100µg/m^3, which includes over 99% of all the data, is presented in Figure 26. This expanded plot demonstrates that April is a month where contributions from local sources are similar to other months of the year but with a broad interquartile range – indicating a large amount of variation in samples.

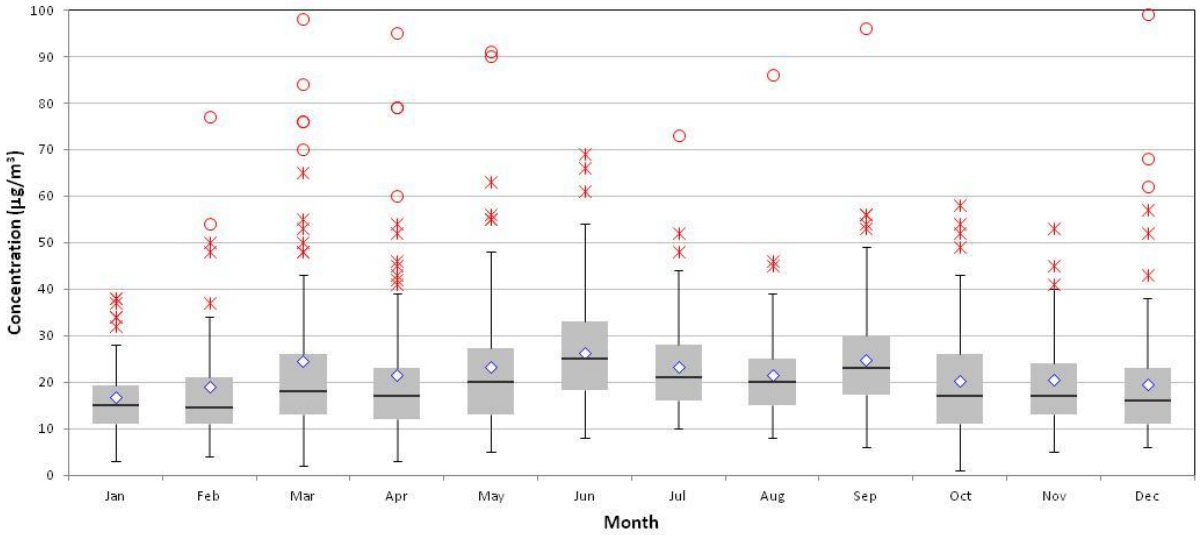

Figure 26: Lamar Municipal PM_{10} Box-Whisker Plot, Reduced Scale, 2008-2012

Note the degree to which the data in the months of fall through spring, beginning in October and extending through May, are skewed. The April mean (21.6 µg/m^3) is greater than the April median value (17 µg/m^3) and is greater than the 66% of all samples in any April. The skew in the data is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are somehow 'dirtier' than other months of the year. This data exposes that perception as flawed, typical data subject to local sources of variation are similar to every other month of the year Figure 26 suggests that typical, day to day PM_{10} concentrations exposures for the month of June and September are highest among all months. The sample of April 02, 2012, clearly exceeds the typical data at this site.

Lamar Power - 080030001

The PM_{10} sample on April 2, 2012, at Lamar Power of 147 µg/m^3 is the 2nd largest sample recorded among all April samples from 2008 through 2012, is the 4th largest sample of all 2012 data. The sample exceeds the 99th percentile value (112 µg/m^3) for the entire dataset. Overall, this sample is the 11th largest sample in the entire data set. All ten samples greater than the event sample are associated with a high wind event. There are 1,818 samples in the Lamar Power dataset. Despite not being in excess of 150 µg/m^3 the sample of April 02, 2012 clearly exceeds the typical samples for this site.

Figure 27 through Figure 30 graphically characterize the Lamar Power PM_{10} data. The first, Figure 27, is a simple time series; every sample in this dataset (2008 – 2012) greater than 150

µg/m^3 is identified. Note the overwhelming mass of samples occupying the lower end of the graph. Of the 1818 samples in this data set less than 1% is greater than 115 µg/m^3.

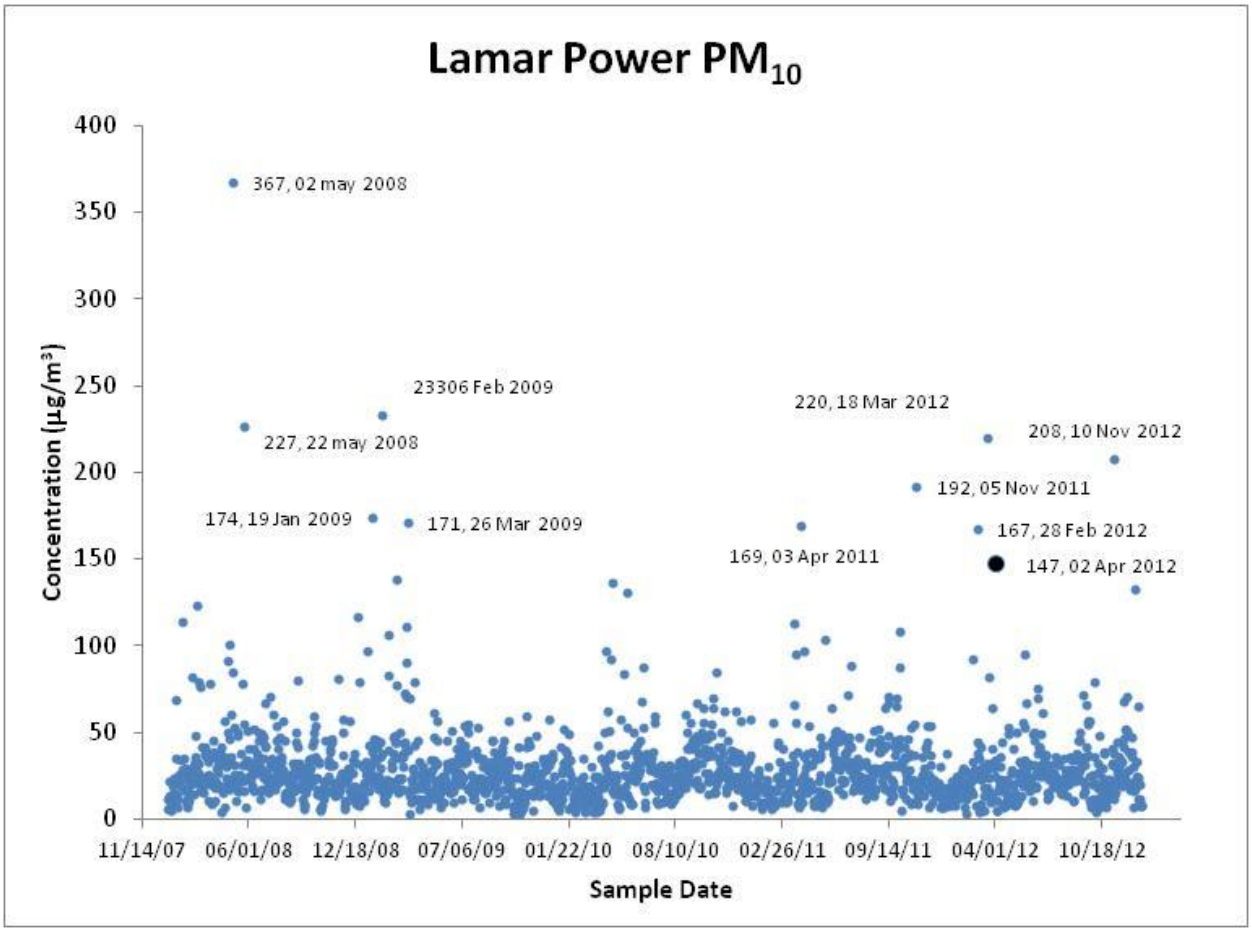

Figure 27: Lamar Power PM_{10} Time Series, 2008-2012

Figure 28, is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. This range of data can be considered typical, representing contributions from local sources. Well over 80% of the samples in this data set are less than 40 µg/m^3. Even in the highly variable months comprising winter and early spring over 90% of the samples are less than 50 µg/m^3. Clearly the sample of April 02, 2012, exceeds what is typical for this site.

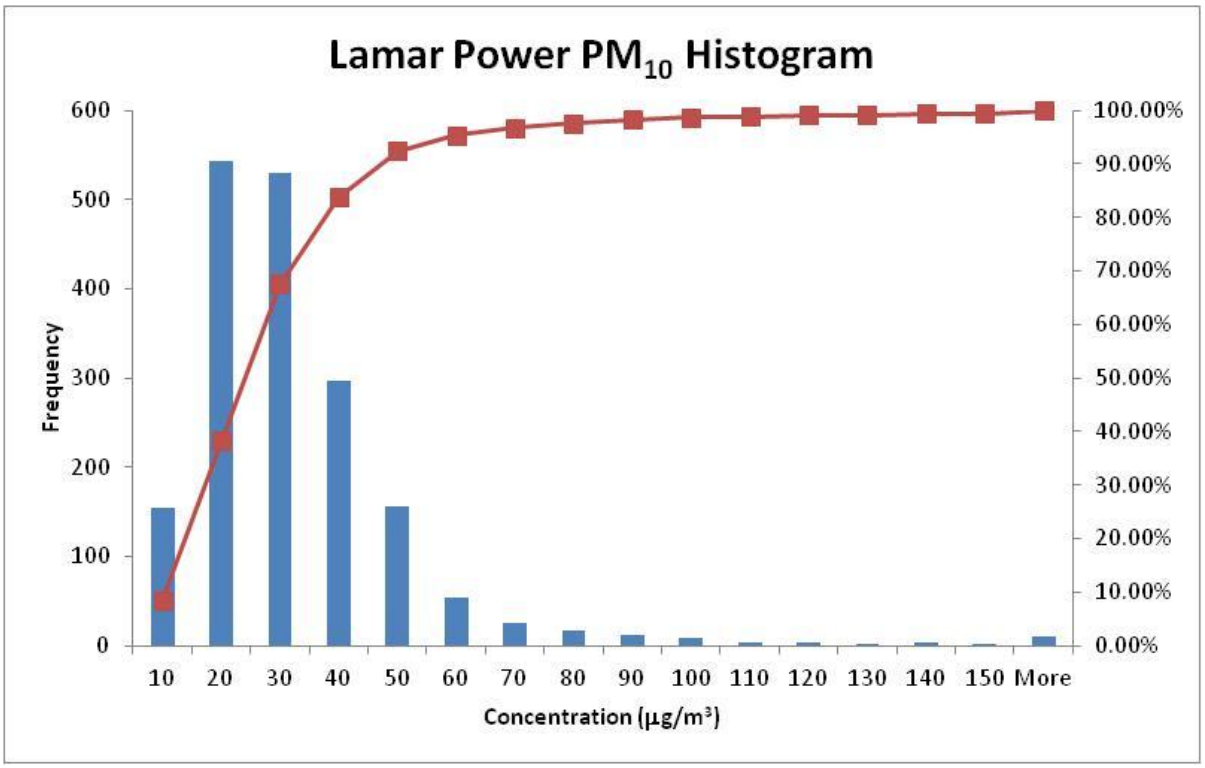

Figure 28: Lamar Power PM_{10} Histogram, 2008-2012

The monthly box-whisker plot in Figure 29 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on April 02, 2012. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

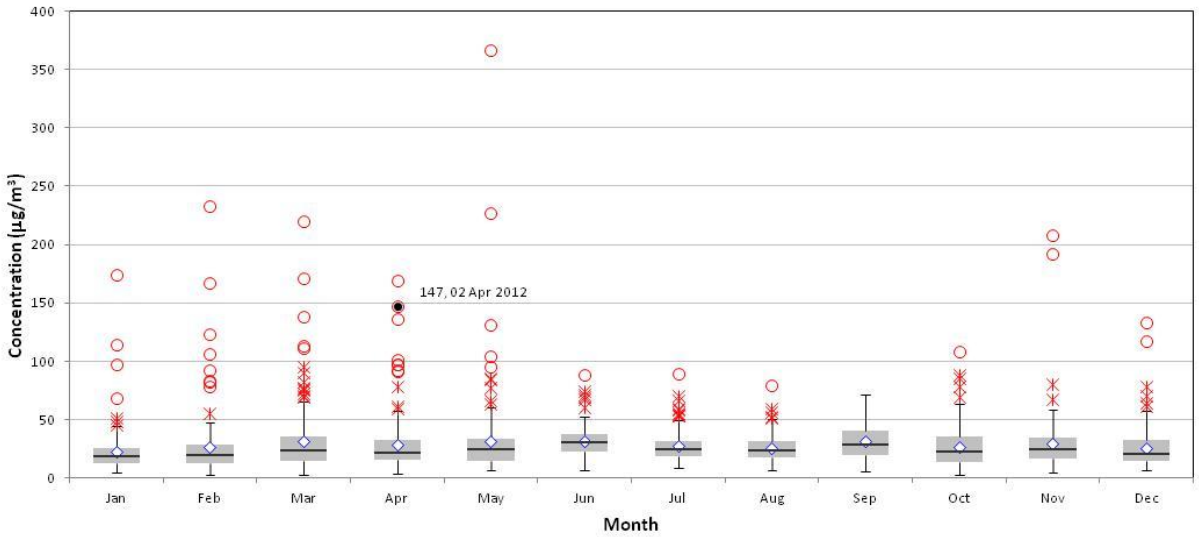

Figure 29: Lamar Power PM_{10} Box-Whisker Plot, 2008-2012

The presence of the extreme values distorts the graph, losing definition and distorting information presented across the small portion of the range where the majority of data resides. The same plot graphed to 100 µg/m^3, which includes almost 99% of all the data, is presented in Figure 30. This expanded plot demonstrates that April is a month where contributions from local sources are similar to other months of the year but with a broad interquartile range – indicating a large amount of variation due to a small number of extreme samples.

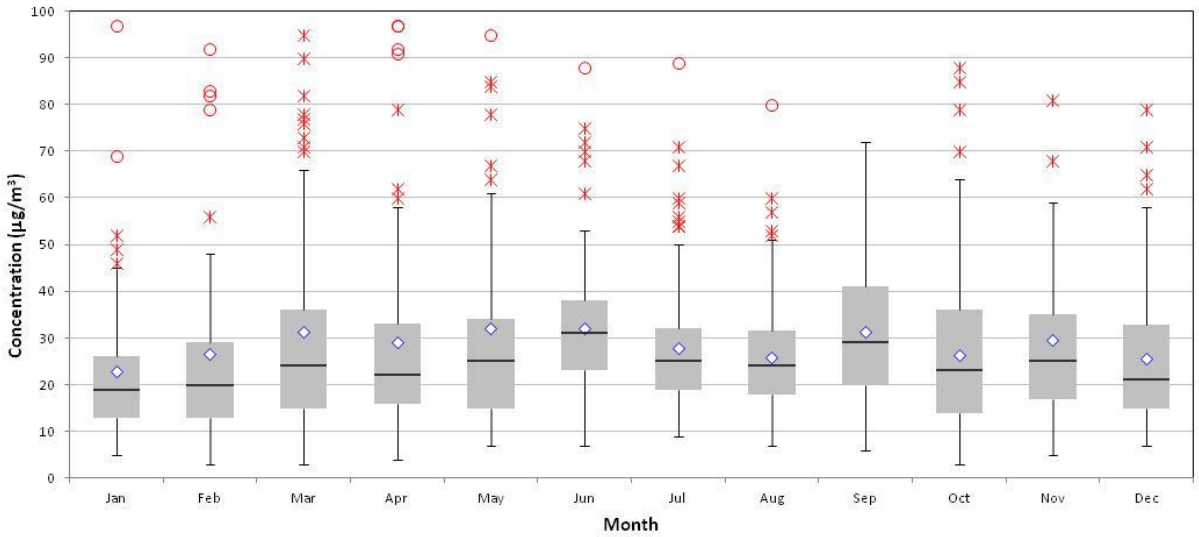

Figure 30: Lamar Power PM_{10} Box-Whisker Plot, Reduced Scale, 2008-2012

3.2 Wind Speed Correlations

Wind speeds in southeast Colorado increased early in the morning April 02, 2012 and stayed elevated throughout the day, gusting to speeds in excess of 50mph. The four charts in Figure 31 display wind speed (mph) as a function of date from meteorological sites within the affected areas for a number of days before and after the event.

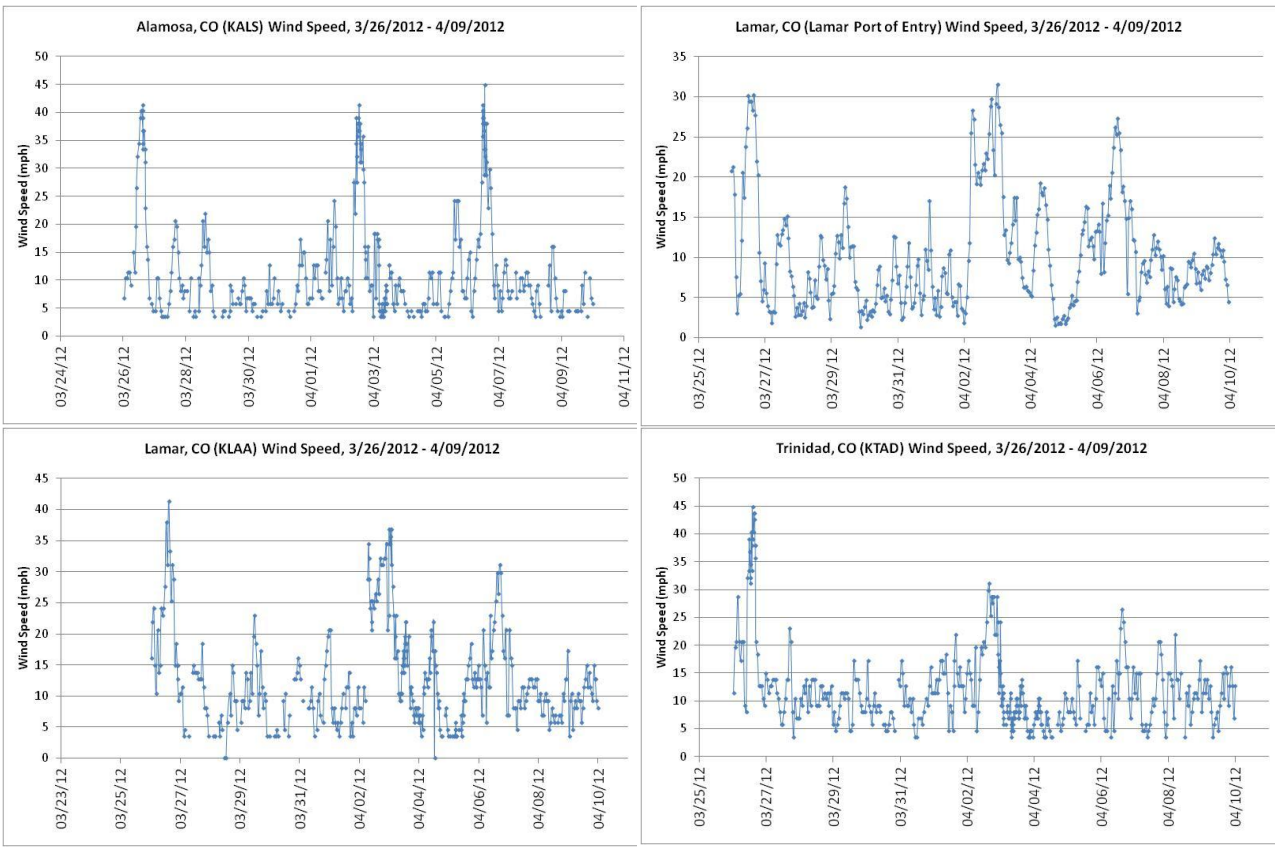

Figure 31: Wind Speed (mph) Affected Sites, 03/25/2012 – 04/09/2012

Figure 32 plots PM_{10} concentrations from the affected sites in Colorado for the period for seven days prior to and following the samples of April 02, 2012.

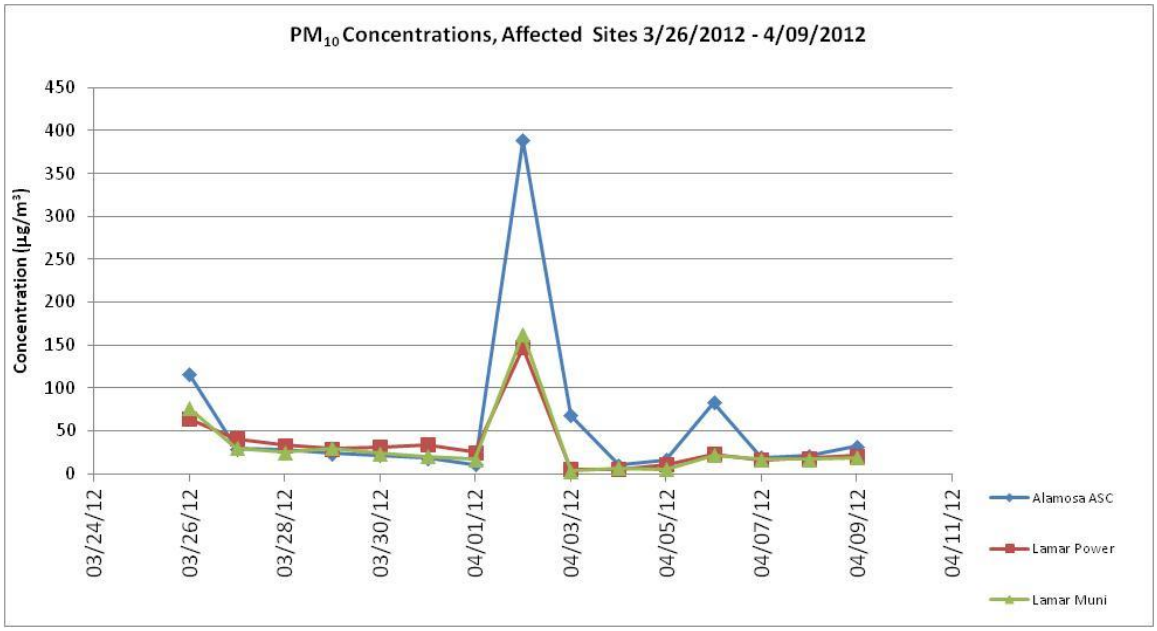

Figure 32: PM_{10} Concentrations, Affected Sites, 03/26/2012 – 04/09/2012

Figure 32 mimics the plots for wind speed, suggesting an association between the regional high winds and PM_{10} concentrations at the affected sites. Although the samples were affected to differing degrees by the event (possibly reflecting the variation in contribution from local sources) the elevated concentrations are clearly associated with the elevated wind speeds. Given the spatial dislocation of the sites the relationship between the two data sets would suggest that the regional high winds had an effect on PM_{10} samples in Lamar and Alamosa on April 02, 2012.

3.3 Percentiles

Monthly percentile plots in Figure 33 demonstrate a high degree of association between monthly median values and relatively high monthly percentile values, e.g. the Pearson's r value between the monthly 90th percentile value at Lamar Power and the monthly median is 0.34. As the percentile value decreases (i.e. 85%, 75%, etc) the correlation between those values and the monthly median values increases sharply. The monthly percentile plots for each site are in Figure 33.

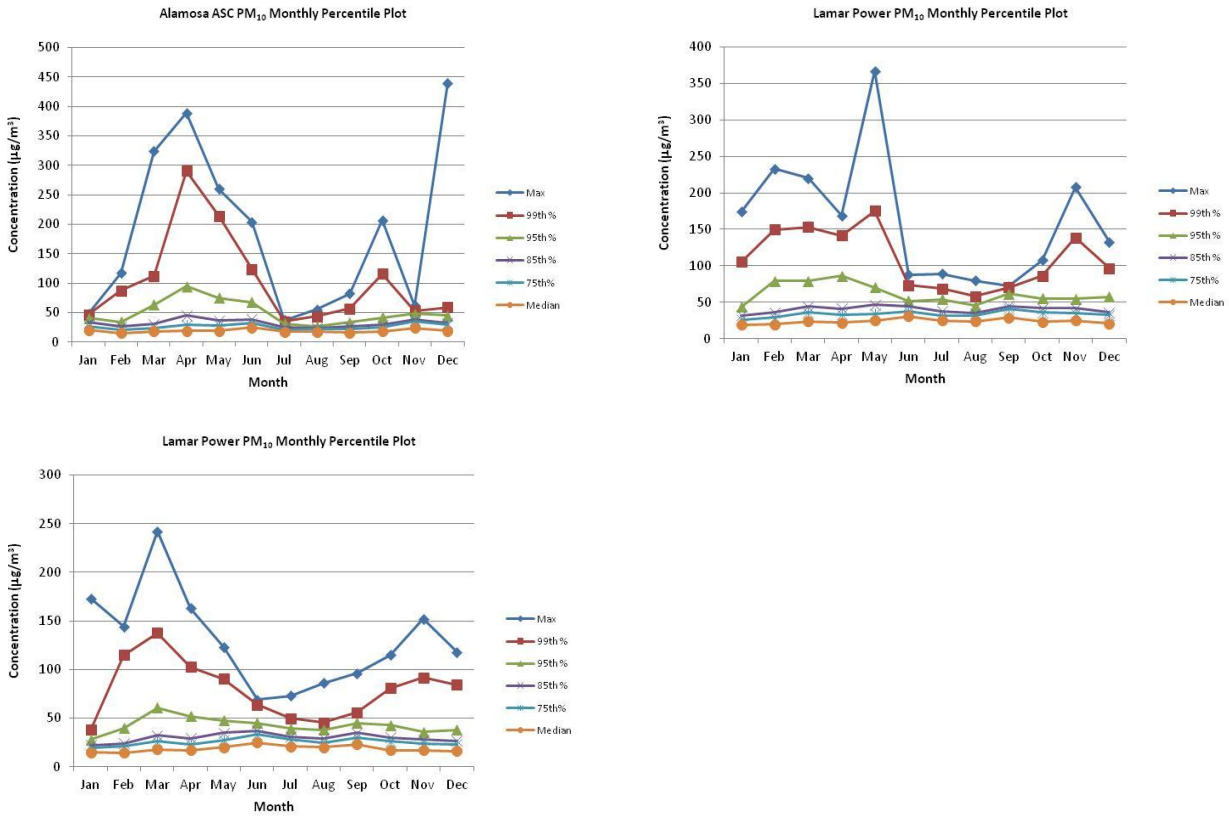

Figure 33: Monthly PM_{10} Percentile Plots

It is certainly the case that monthly median values are indicative of typical, day to day concentrations. Additionally, there is a range of samples that are a product of normal variation subject to typical, day to day local effects. This range may be restricted to

percentile values that are well correlated with the median. For the data sets of concern (Alamosa ASC, Lamar Power, and Lamar Muni) a conservative estimate of the percentile value that is reflective of typical, day to day variation is the 75th percentile value. Nearly all of the variation in the monthly 75th percentile values of these three data sets can be explained by the variation in monthly medians; for these three sites the correlation between the median and monthly 75th percentile values vary from an r^2 = 0.95 (Lamar Muni) to an r^2 = 0.83 (Lamar Power). A reasonable estimate of the contribution to the event from local sources for these data sets may be the monthly 85th percentile values; for these three sites the correlation between the median and the monthly 85th percentile values vary from an r^2 = 0.69 (Alamosa ASC) to an r^2 = 0.88 (Lamar Muni). If these percentile values are taken as an estimate of event PM_{10} due to local variation then the portion of the sample concentration remaining from these monthly percentile values would be the sample contribution due to the event.

Table 9 identifies various percentile values that are representative of the maximum contribution due to local sources for each site from all April data for both sample dates. In Table 9 the range estimate in the 'Est. Conc. Above Typical' column is derived using the difference between the actual sample value and the 85th percentile as the minimum (reasonable) event contribution estimate and the difference between the actual sample value and the 75th percentile as the maximum (conservative) event contribution estimate. This column represents the range of estimated contribution to the April 02, 2012 sample at the sites listed in the table due to the high wind event.

Table 9: Estimated Maximum Event PM_{10} Contribution - Alamosa ASC, Lamar Muni, Lamar Power

Site	Event Day Concentration (µg/m^3)	April Median (µg/m^3)	April Average (µg/m^3)	April 75th % (µg/m3)	April 85th % (µg/m3)	Est. Conc. Above Typical (µg/m^3)
Alamosa ASC	389	19	32.2	29	44.8	**344 - 360**
Lamar Power	147	22	29.0	33	41.4	**106 - 114**
Lamar Muni	163	17	21.6	23	29	**134 - 140**

Clearly, there would have been no exceedance on April 2, 2012, but for the additional contribution to the PM_{10} samples provided by the event.

4.0 News and Credible Evidence

Sign In | Sign Up

Blowing Dust Advisory For Eastern Colorado

By Todd Harding April 2, 2012 10:09 AM

Share on Facebook | Share on Twitter

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Are we in another Dust Bowl? Is this the "Dirty 30's"? You can feel it in the air! My allergies are killing me and I bet yours are too! The Colorado Department of Public Health and Environment has issued a Blowing Dust Advisory for portions of Eastern Colorado until 4 p.m. today. The National Weather Service has also issued a High Wind Warning for Northeastern Colorado until noon today. Expect gusts up to 60 miles per hour across the Eastern Plains of the state.

AREAS AFFECTED BY BLOWING DUST ADVISORY

Sterling, Ft. Morgan, Akron, Limon, Colorado Springs, Burlington, Pueblo, Springfield, Lamar, La Junta, and Las Animas.

WHAT TO DO IF YOU ARE IN THE ADVISORY AREA

In areas where blowing dust has reduced visibilities to less than 10 miles, people with heart or lung disease, older adults, and the very young should reduce prolonged or heavy indoor or outdoor exertion.

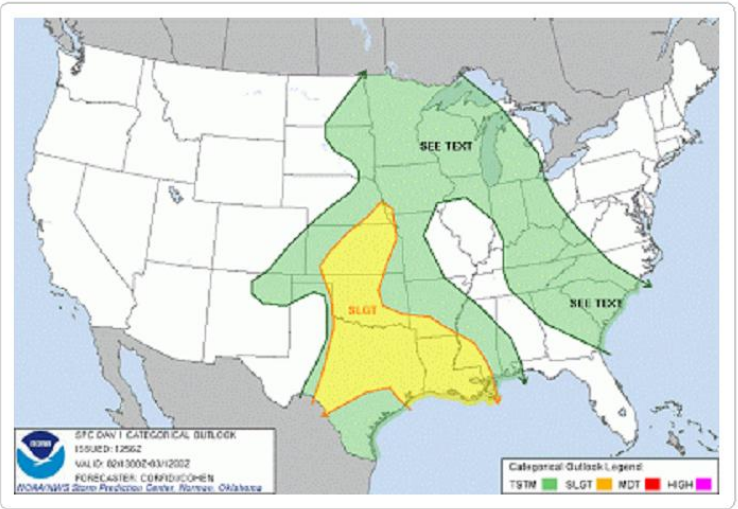
Retrieved from: http://k99.com/blowing-dust-advisory-for-eastern-colorado/

The Original Weather Blog

We didn't invent the weather (God did that)....just the weather blog...

Monday, April 2, 2012

Severe Thunderstorms Likely Central and Southern Plains Today / Tonight...



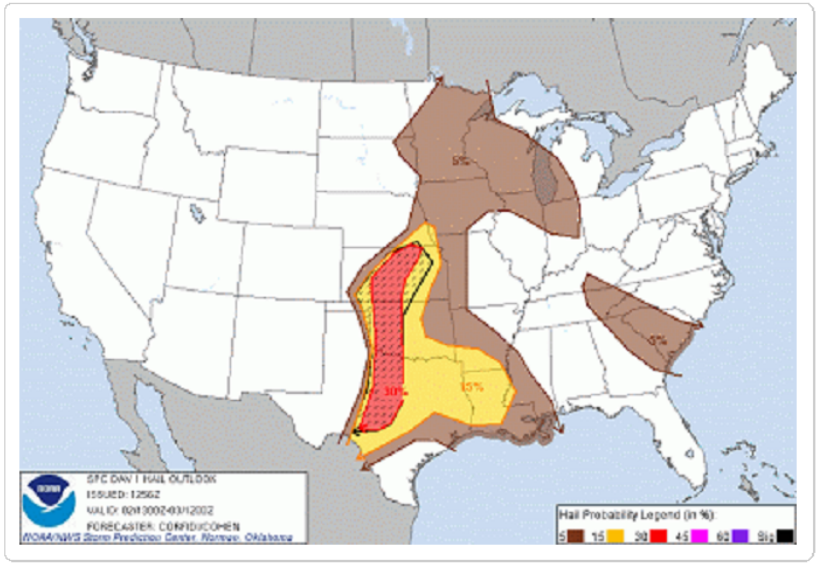
Above is the latest severe weather outlook for this afternoon through tonight from the Storm Prediction Center (SPC) in Norman, OK. Severe storms are forecast within the yellow shaded area on the image.

There are two basic areas on which to focus within the overall severe weather outlook area. The first is associated with a weak disturbance moving toward the North/Northeast along the middle Texas coast. This disturbance is currently causing strong thunderstorm activity in the Houston area, and a threat for strong to severe storms will continue to spread North/Northeast into southeast Texas and adjacent portions of Louisiana during the day today.

Hail and strong, gusty winds will be the primary severe threats in this area.

Further West, a surface front and dryline are forecast to extend near the Western edge of the severe weather outlook area, from central and western Kansas in to western Oklahoma and west Texas by late afternoon.

Thunderstorms are forecast to develop along these boundaries by late afternoon, with large hail, damaging winds and isolated tornadoes possible. Very large hail (2 inches in diameter or greater) is possible within the red and black hatched area on the image below:



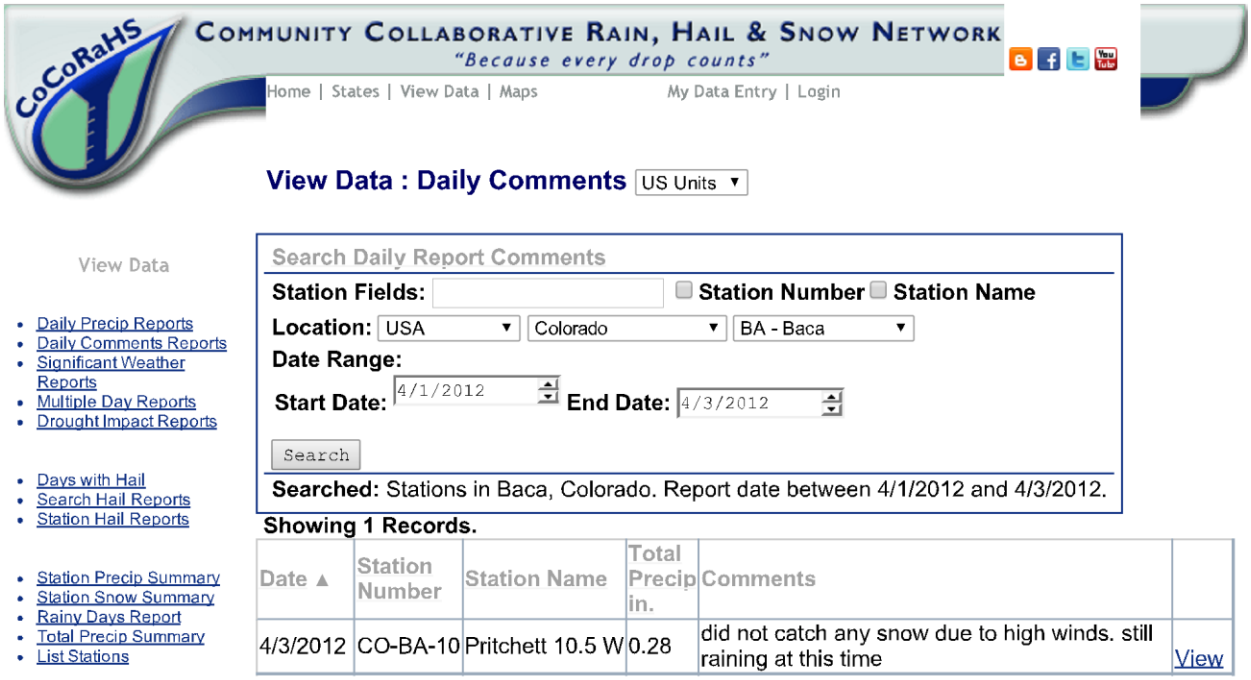
Once developed, this activity may organize into one or more thunderstorm complexes that will move Eastward overnight and into the pre-dawn hours of Tuesday. It is unclear at this time exactly where those complexes may develop and/or threaten overnight...stay tuned for updates today, especially if you live toward the East of the initial severe weather outlook areas.

If you live in the severe weather threat areas for today, please remain alert to the possibility of severe weather during the indicated time periods. Listen to NOAA Weather Radio, local media or another trusted source for later statements and possible warnings. Also, please make sure that you've identified the best sheltering option for your location as well.

If you enjoy the blog, please click on the icons below to "Like" my facebook page and/or follow me on twitter. You'll find posts at these locations that aren't always on the blog, especially during rapidly changing weather situations...

Posted by Rob White at 8:13 AM

Retrieved from: http://originalweatherblog.blogspot.com/2012/04/severe-thunderstorms-likely-central-and.html



COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK
"Because every drop counts"
Home | States | View Data | Maps My Data Entry | Login

View Data : Daily Comments US Units

View Data

- Daily Precip Reports
- Daily Comments Reports
- Significant Weather Reports
- Multiple Day Reports
- Drought Impact Reports
- Days with Hail
- Search Hail Reports
- Station Hail Reports
- Station Precip Summary
- Station Snow Summary
- Rainy Days Report
- Total Precip Summary
- List Stations

Search Daily Report Comments

Station Fields: Station Number Station Name

Location: USA Colorado BA - Baca

Date Range:

Start Date: 4/1/2012 End Date: 4/3/2012

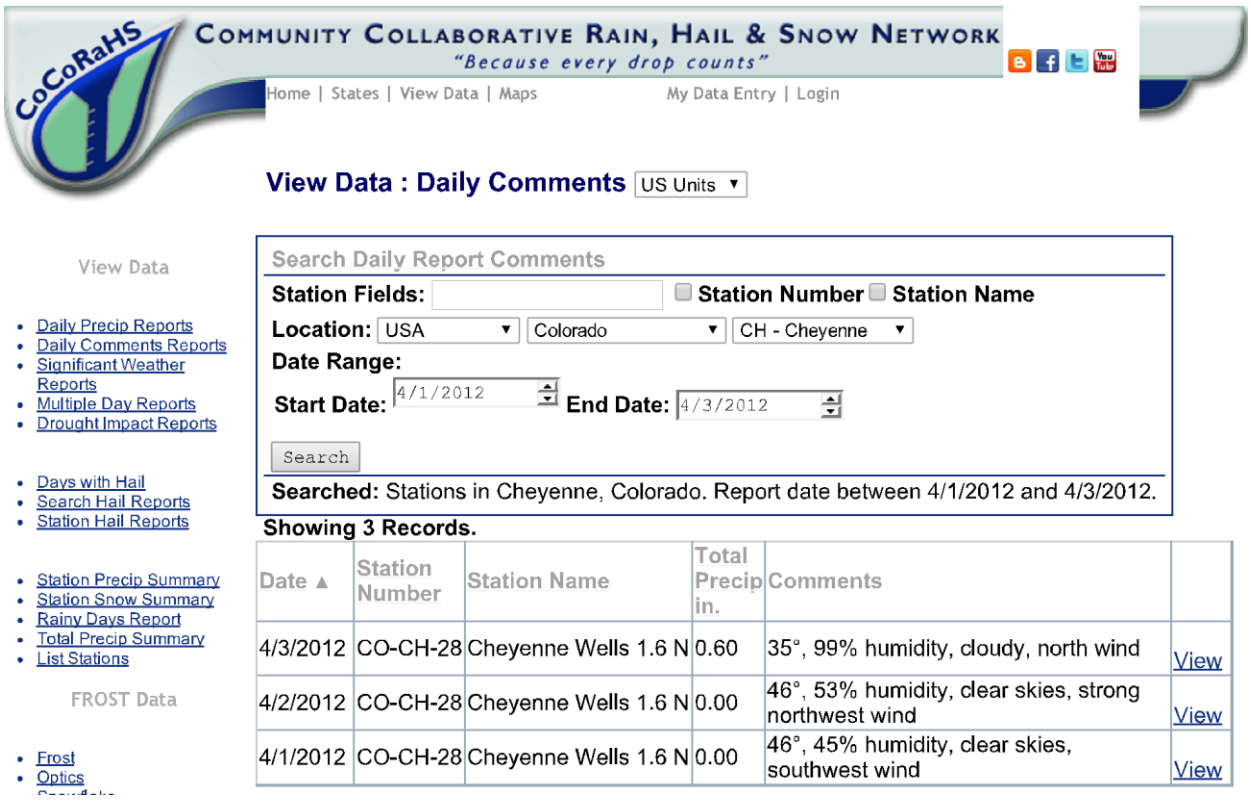
Search

Searched: Stations in Baca, Colorado. Report date between 4/1/2012 and 4/3/2012.

Showing 1 Records.

Date ▲	Station Number	Station Name	Total Precip in.	Comments	
4/3/2012	CO-BA-10	Pritchett 10.5 W	0.28	did not catch any snow due to high winds. still raining at this time	View

Retrieved from: http://www.cocorahs.org/ViewData/ListDailyComments.aspx



COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK
"Because every drop counts"
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View Data : Daily Comments US Units

View Data

- Daily Precip Reports
- Daily Comments Reports
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- Days with Hail
- Search Hail Reports
- Station Hail Reports
- Station Precip Summary
- Station Snow Summary
- Rainy Days Report
- Total Precip Summary
- List Stations

FROST Data

- Frost
- Optics

Search Daily Report Comments

Station Fields: Station Number Station Name

Location: USA Colorado CH - Cheyenne

Date Range:

Start Date: 4/1/2012 End Date: 4/3/2012

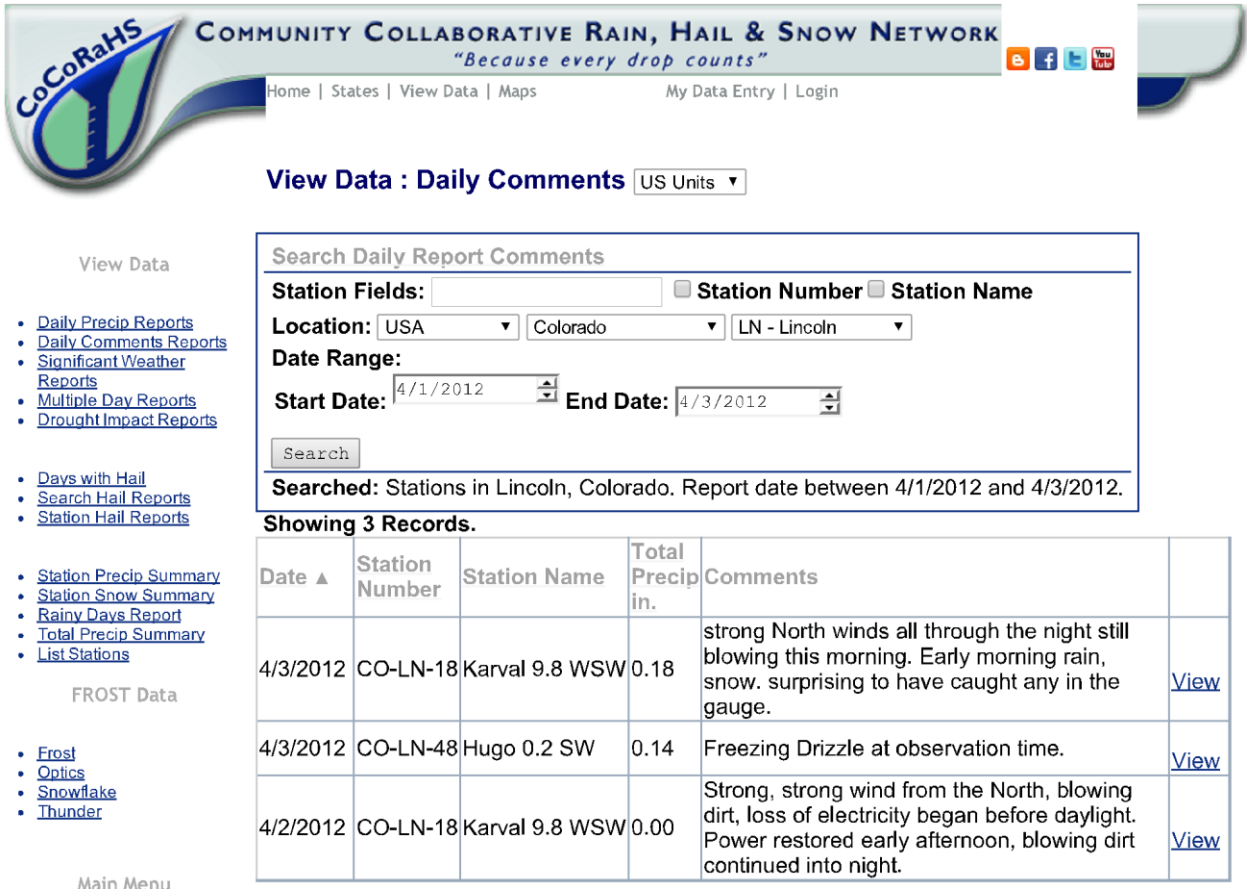
Search

Searched: Stations in Cheyenne, Colorado. Report date between 4/1/2012 and 4/3/2012.

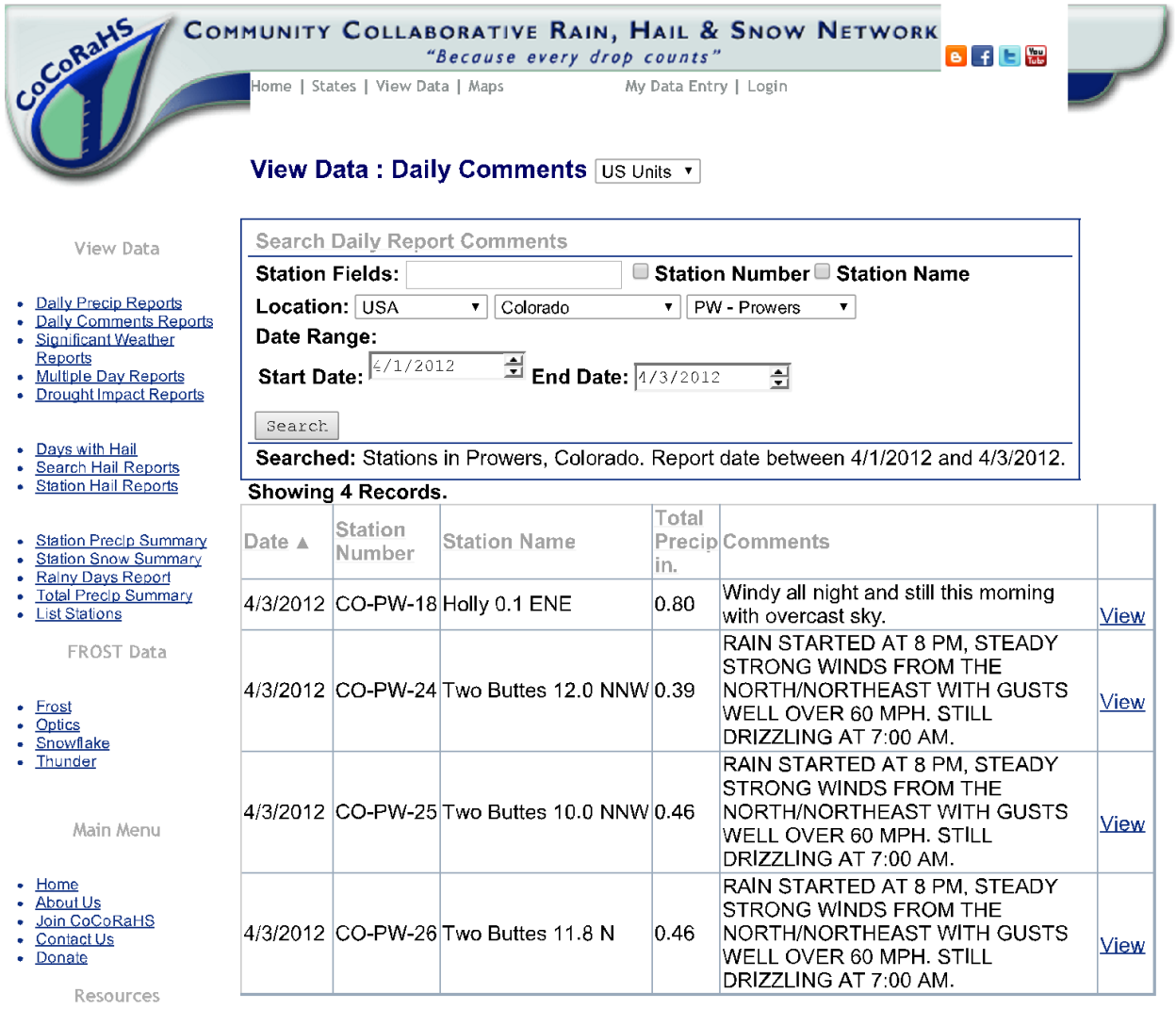
Showing 3 Records.

Date ▲	Station Number	Station Name	Total Precip in.	Comments	
4/3/2012	CO-CH-28	Cheyenne Wells 1.6 N	0.60	35°, 99% humidity, cloudy, north wind	View
4/2/2012	CO-CH-28	Cheyenne Wells 1.6 N	0.00	46°, 53% humidity, clear skies, strong northwest wind	View
4/1/2012	CO-CH-28	Cheyenne Wells 1.6 N	0.00	46°, 45% humidity, clear skies, southwest wind	View

Retrieved from: http://www.cocorahs.org/ViewData/ListDailyComments.aspx



Retrieved from: http://www.cocorahs.org/ViewData/ListDailyComments.aspx



Retrieved from: http://www.cocorahs.org/ViewData/ListDailyComments.aspx

5.0 Not Reasonably Controllable or Preventable: Local Particulate Matter Control Measures

While it is likely that some dust was generated within the local communities as gusts from the regional dust storm passed through the area, the amount of dust generated locally was easily overwhelmed by, and largely unnoticeable as compared to the dust transported in from western Nebraska and eastern Colorado. The following sections will describe in detail the regulations and programs in place designed to control PM_{10} in each affected community. These sections will demonstrate that the event was not reasonably controllable, as laid out in Section 50.1(j) of Title 40 CFR 50, within the context of reasonable local particulate matter control measures. As shown from the meteorological and monitoring analyses (Sections 2 and 3), the source region for the associated dust that occurred during the April 2, 2012 event originated outside of the monitored areas, primarily into Lamar from western Nebraska and eastern Colorado and into Alamosa from the eastern side of the San Luis Valley and from the eastern plains via Medano and Mosca Passes.

The APCD conducted thorough analyses and outreach with local governments to confirm that no unusual anthropogenic PM_{10}-producing activities occurred in these areas and that despite reasonable control measures in place, high wind conditions overwhelmed all reasonably available controls. The following subsections describe in detail Best Available Control Measures (BACM), other reasonable control measures, applicable federal, state, and local regulations, appropriate land use management, and an in-depth analysis of potential areas of local soil disturbance for each affected community during the April 2, 2012, event. This information shall confirm that no unusual anthropogenic actions occurred in the local areas of Alamosa and Lamar during this time.

5.1 Regulatory Measures - State

The APCDs regulations on PM_{10} emissions are summarized in Table 10.

Table 10: State Regulations Regulating Particulate Matter Emissions

Rule/Ordinance	Description
Colorado Department of Public Health and Environment Regulation 1- Emission Control For Particulate Matter, Smoke, Carbon Monoxide, And Sulfur Oxides	Applicable sections include but are not limited to: Everyone who manages a source or activity that is subject to controlling fugitive particulate emissions must employ such control measures and operating procedures through the use of all available practical methods which are technologically feasible and economically reasonable and which reduce, prevent and control emissions so as to facilitate the achievement of the maximum practical degree of air purity in every portion of the State. Section III.D.1.a) Anyone clearing or leveling of land greater than five acres in attainment areas or one acre in non-attainment areas from which fugitive particulate

	emissions will be emitted are required to use all available and practical methods which are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions.(Section III.D.2.b) Control measures or operational procedures for fugitive particulate emissions to be employed may include planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks and other methods or techniques approved by the APCD. (Section III.D.2.b) Any owner or operator responsible for the construction or maintenance of any existing or new unpaved roadway which has vehicle traffic exceeding 200 vehicles per day in the attainment/maintenance area and surrounding areas must stabilize the roadway in order to minimize fugitive dust emissions (Section III.D.2.a.(i))
Colorado Department of Public Health and Environment Regulation 3- Stationary Source Permitting and Air Pollutant Emission Notice Requirements	Construction Permit required if a land development project exceeds 25 acres and spans longer than 6 months in duration (Section II.D.1.j) All sources with uncontrolled actual PM_{10} emissions equal to or exceeding five (5) tons per year, must obtain a permit. The new source review provisions require all new and modified major stationary sources in non-attainment areas to apply emission control equipment that achieves the "lowest achievable emission rate" and to obtain emission offsets from other stationary sources of PM_{10}.
Colorado Department of Public Health and Environment Regulation 4- New Wood Stoves and the Use of Certain Woodburning Appliances During High Pollution Days	Regulates wood stoves, conventional fireplaces and woodburning on high pollution days. Prohibits the sale and installation a wood-burning stove in Colorado unless it has been tested, certified, and labeled for emission performance in accordance with criteria and procedures specified in the Federal Regulations and meets emission standards. (Section II) Section III regulates pellet stoves. Section IV regulates masonry heaters. Section VII limits the use of stoves on high pollution days.
Colorado Department of Public Health and Environment	Implements federal standards of performance for new stationary sources including ones that have particulate

Regulation 6- Standards of Performance for New Stationary Sources	matter emissions. (Section I)
Colorado Department of Public Health and Environment Regulation 9- Open Burning, Prescribed Fire, and Permitting	Prohibits open burning throughout the state unless a permit has been obtained from the appropriate air pollution control authority. In granting or denying any such permit, the authority will base its action on the potential contribution to air pollution in the area, climatic conditions on the day or days of such burning, and the authority's satisfaction that there is no practical alternate method for the disposal of the material to be burned. Among other permit conditions, the authority granting the permit may impose conditions on wind speed at the time of the burn to minimize smoke impacts on smoke-sensitive areas. (Section III)
Colorado Department of Public Health and Environment- Common Provisions Regulation	Applies to all emissions sources in Colorado When emissions generated from sources in Colorado cross the state boundary line, such emissions shall not cause the air quality standards of the receiving state to be exceeded, provided reciprocal action is taken by the receiving state. (Section II A)
Federal Motor Vehicle Emission Control Program	The federal motor vehicle emission control program has reduced PM_{10} emissions through a continuing process of requiring diesel engine manufacturers to produce new vehicles that meet tighter and tighter emission standards. As older, higher emitting diesel vehicles are replaced with newer vehicles; the PM_{10} emissions in areas will be reduced.

5.2 Alamosa

Natural Events Action Plan (NEAP)

The Final NEAP for High Wind Events in Alamosa, Colorado was completed in May 2003. The NEAP addresses public education programs, public notification and health advisory programs, and determines and implements Best Available Control Measures (BACM) for anthropogenic sources in the Alamosa area. The APCD followed up with the City and County of Alamosa in January 2007 and in the spring of 2013 on whether the NEAP mitigation measures and commitments were satisfied, the results of which are detailed below. The City of Alamosa, Alamosa County, the APCD, and participating federal agencies worked diligently to identify contributing sources and to develop appropriate BACM as required by the Natural Events Policy.

Regulatory Measures - City and County

The APCD, the City of Alamosa, and Alamosa County are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources,

fugitive dust sources, and open burning within Alamosa. Alamosa's ordinances of PM_{10} emissions are summarized in Table 11.

Table 11: Rules and Ordinances Regulating Particulate Matter Emissions in Alamosa

Rule/Ordinance	Description
City of Alamosa Code of Ordinances Article VII of Section 21-140 (5)	Addresses dust control for home occupations
City of Alamosa Code of Ordinances Article V Sec. 17-87(3))	Requires all new roads and alleys to be paved
City of Alamosa Code of Ordinances (Article VI Sec. 21-119(g)(3)).	New large commercial/retail establishments must install underground automatic irrigation systems for all landscaped areas
Alamosa County Land Use and Development Code (1.4.2)	Agriculture an important part of the economy and adds intrinsic value to life in Alamosa County. Agriculture, as a business, brings dust and other inconveniences. To maintain this way of life, Alamosa County intends to protect agricultural operators from unnecessary, intrusive litigation. Therefore, no inconvenience shall be considered a nuisance so long as it occurs as a part of non-negligent and legal agricultural practice, as stated in C.R.S. 35-3.5-101, 102 and 103.
Alamosa County Land Use and Development Code (3.5.2(A)(8))	For Feed lot, animal waste treatment, or animal waste collection facilities fugitive dust shall be confined on the property
Alamosa County Land Use and Development Code (3.5.6(D)(2))	For a proposed oil and gas well installation, any interior transportation network shall be paved, or the company shall undertake appropriate dust abatement measures
Alamosa County Land Use and Development Code (3.5.7(G))	All roads, driveways, parking lots and loading and unloading areas within 500 feet of any lot line shall be graded and paved with an approved concrete or asphalt/concrete surface as to limit adjoining lots and public roads the nuisance caused by wind-borne dust.
Alamosa County Land Use and Development Code (4.2.3(C)(2))	Where off-street facilities are provided for parking or any other vehicular use area, they shall be surfaced with asphalt bituminous, concrete or other dustless material approved by the administrator and shall be maintained in a smooth, well-graded condition.

City of Alamosa's Control Measures

The City of Alamosa has been active in addressing potential PM_{10} sources within the Alamosa area through various efforts. Some of these efforts, plus other potential future measures,

include the adoption of local ordinances to reduce PM_{10}. Copies of current ordinances and any related commitments are included in the NEAP in Appendix C. According to the City's Public Works Director in 2013, the City was planning on adding additional dust control best management practices to the International Building Codes that are adopted by the city in the next update. The best management practices will include requiring a Dust Control Plan for any site that is issued a clearing permit for any site over 2 acres. The City was also (as of 2013) working on revising part of their landscaping ordinances to require mulch in areas that are not vegetated or covered by rock to help mitigate fugitive particulate emissions. These efforts have been stalled in the past due to employee turnover at City Manager's Office.

Street Sweeping
The City of Alamosa sweeps on an every 4-week schedule or as needed, as determined by local officials on a case by case situation (e.g., following each snowstorm and/or where sand was applied). Sweeping occurs on every single City street with an emphasis on the downtown corridor where public exposure is expected to be greatest. As of spring 2013, street sweeping in the downtown corridor takes place twice per week according to the City's Public Works Director.

According to the City's Public Works Director, in 2013, the city owned an Elgin Pelican (mobile mechanical sweeper) and a Tymko 600 (brush-assisted head) street sweeper. In June 2013, the City purchased a new Elgin Broom Badger street sweeper at which time the Tymko 600 was sent in for a re-build. The new Elgin Broom Badger street sweeper can be used in the winter months when the Tymko cannot due to freezing of the water delivery system.

Unpaved Roads within the City
The City of Alamosa (as of 2008) requires all new roads and alleys to be paved according to the Municipal Code (Article V Sec. 17-87(3)) and some existing unpaved roads are being treated with dust suppressants until all underground utilities are installed. No new development is allowed until paving is complete unless a performance bond is in place.

According to the City's Public Works Director, as of 2013, less than 3% of City roads are unpaved; most of these unpaved roads are legacy annexations. One of these unpaved roads was scheduled for paving in 2013. The remaining unpaved roads are all low traffic (less than 100 ADT) and the City continues to seek funding sources for paving these streets.

Sod/Vegetative Cover Projects in the City of Alamosa
As of 2008, the City of Alamosa placed vegetative cover in all city parks and has installed irrigation systems to maintain the cover. As of 2013, the City has been emphasizing more low-water use landscaping with shrubs, mulch, etc. including both organic and rock. All turf areas do have irrigation systems which utilize drip systems for specimen plantings.

Alamosa County's Control Measures

Alamosa County has also been active in addressing blowing dust as detailed below.

Unpaved Roads
Alamosa County continues to address unpaved roads and lanes that are anticipated to contribute to PM_{10} emissions in the community. As of 2002, Alamosa County was nearing the end of its five-year road paving plan and was developing their next plan with the intention of

paving on a yearly basis, based on traffic, community needs/priorities, and funding availability.

In 2002, Alamosa County addressed approximately ten (10) miles of unpaved roads. This includes the stabilization of approximately five section roads, the seal coating of two roads, and the overlay (repaving) of four (4) additional roads.

In 2003, approximately 14 miles of roads were paved. This included the Seven Mile Road (three miles long), Road 109 (one mile long), and 10th Street (also one mile long). These roads are in close proximity to the City of Alamosa, are upwind (prevailing) from the city, and have heavy traffic. Paving is anticipated to greatly reduce blowing dust and impacts in the vicinity.

No paving projects took place between 2004 and 2010 due to lack of funding. Between 2010 and 2013, the County was able to get funding but only for maintenance paving on previously paved roads that needed repair. Now that the county is caught up on maintenance paving, it is focusing on paving the remaining unpaved roads. The County's goal is to pave about 2.5 miles of unpaved road per year depending on funding availability.

As of 2013, Alamosa County has funding to pave approximately 2.5 miles of County Road 106 North (located north of Alamosa off of Highway 17) which is currently unpaved. After this paving project the County will only have 2.5 miles of unpaved road remaining on the 106 North which is anticipated to be paved in the summer of 2014.

In the summer time the County regularly hauls water and wets down the unpaved roads (mostly gravel, clay and sand) to reduce the fugitive particulate emissions. The County wets the unpaved roads on an as needed basis based on weather conditions and traffic volume. In addition, when it gets cold enough in the area, the County wets down some of the more sandy roads. Once the water soaks in and freezes, good dust suppression is seen. Road construction areas are being dampened with water for dust control. These practices reduce PM_{10} emissions in and near Alamosa. This control measure is balanced with the availability of water in the area.

Alamosa County used to assess the need to use $MgC1_2$ treatment on roads in front of residences that request such service. This practice stopped in 2004 when funding was lost. Assessments included the sensitivity to dust of residents, the materials of the road base for safety reasons, and possible environmental concerns of the neighborhood. Most requests for treatment are were granted. Other areas for treatment, such as commercial construction zones or gravel pits, are investigated on a case by case basis. The County hopes to be able to start offering this service again when funding is restored.

Dust Control Plans

Alamosa County requires dust control plans for selected construction/developments. The dust control plans are typically done through a negotiated agreement by the Alamosa Land Use Department and is supported by zoning codes.

The County may update the Comprehensive Plan to include a dust control plan. The Land Use Administrator is researching the potential for a dust control ordinance. This effort is anticipated to reduce PM_{10} emissions in Alamosa, especially as it relates to impacts on the community and high recorded PM_{10} values. At the time of this submittal (December 2013), this effort is still underway.

Wind Erosion of Open Areas
To reduce PM_{10} emissions from open areas outside of the City limits, low tilling and other soil conservation practices continue to be utilized in the community. The Mosca-Hooper Conservation District and Natural Resources Conservation Service is working on education efforts to promote cover crops and no-till agriculture. In addition, the community is using in strategic areas the Colorado State Forest Service's program to purchase and plant shelter trees to reduce wind erosion in open areas. Nursery seedlings from the program have been sold in Alamosa County since 1956. The number of seedlings sold has varied over the last few years as illustrated in Table 12.

Table 12: Number of Seedlings Sold in Alamosa per Year.

Year:	2008	2009	2010	2011	2012	2013
Seedlings Sold:	7,432	5,963	2,805	4,197	3,327	4,231

These trees have a demonstrated advantage for the community and for air quality. Once the trees reach maturity, it is anticipated that the equivalent of 112 miles of double-rowed trees will be in place. The survival rate of the tree seedlings varies but according to the District Coordinator for the Seedling Tree Program, potted seedlings have about a 60% to 80% survival rate and the bare root seedlings have about a 40 to 60% survival rate. The Seedling Program recommends Siberian elm and Rocky Mountain juniper trees for low maintenance, drought resistance windbreaks in the valley, but offers over 40 varieties to suit specific site conditions. The Colorado State Forest Service and the Mosca-Hooper Conservation District promote the windbreak program through workshops and consulting landowners.

In addition, there is ongoing planting of trees (approximately 50) on newly developed Alamosa County property south/southwest of Alamosa (prevailing winds from southwest) and the Airport south of Alamosa for added air quality improvement. Also, The Bureau of Reclamation has an ongoing project to plant windbreaks along their Closed-Basin Canal.

Windblown Dust from Disturbed Soils
Alamosa has a semi-arid climate with approximately 7.25 inches of precipitation annually. The San Luis Valley, as noted within 25 miles of the San Luis Valley Regional Airport in Alamosa, is primarily comprised of forests (43%) and shrublands (42%). Consequently, soils in all areas are typically a mixture of silt and sand with limited vegetation due to low precipitation. In winter and spring, windstorms are common, especially in drier years. It is due to these high velocity windstorms that Alamosa experiences most of the PM_{10} problems for the area. Figure 34 through Figure 44 illustrate potential areas of local soil disturbance that have been evaluated by the APCD for the Alamosa Adams State PM_{10} monitor.

Figure 34: Relative positions of Adam's State College PM_{10} Monitor, wind direction and potential disturbed soil. (Google Earth 2013)

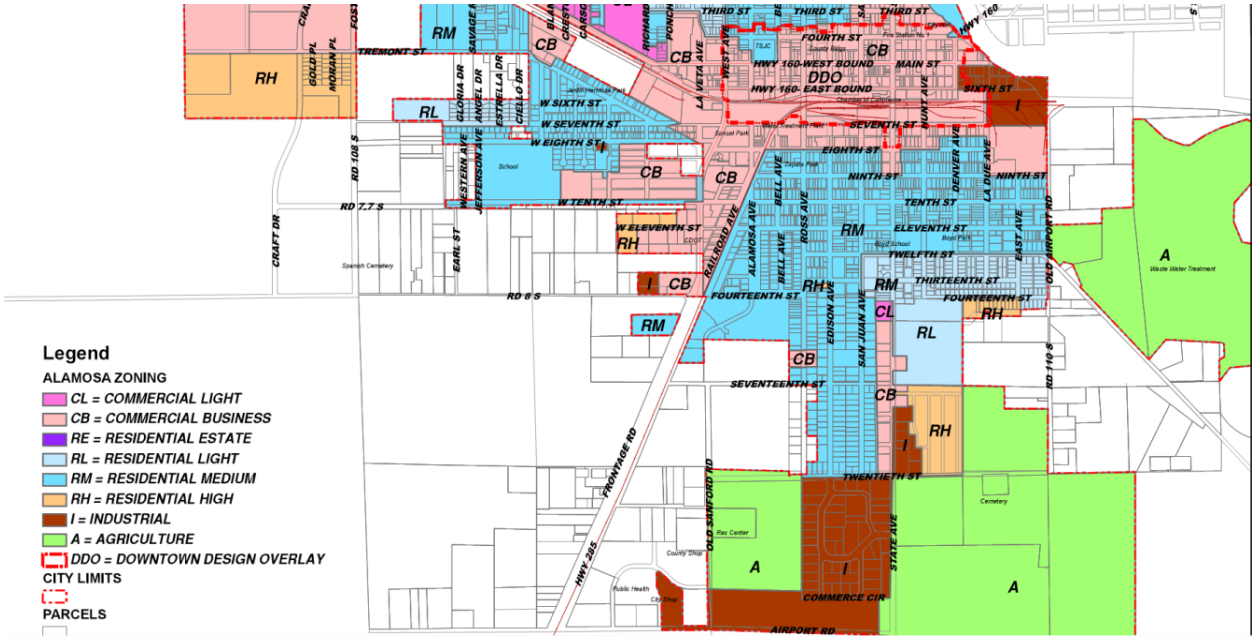


Figure 35: 2011 City of Alamosa Zoning Map (Provided by the Public Works Department)

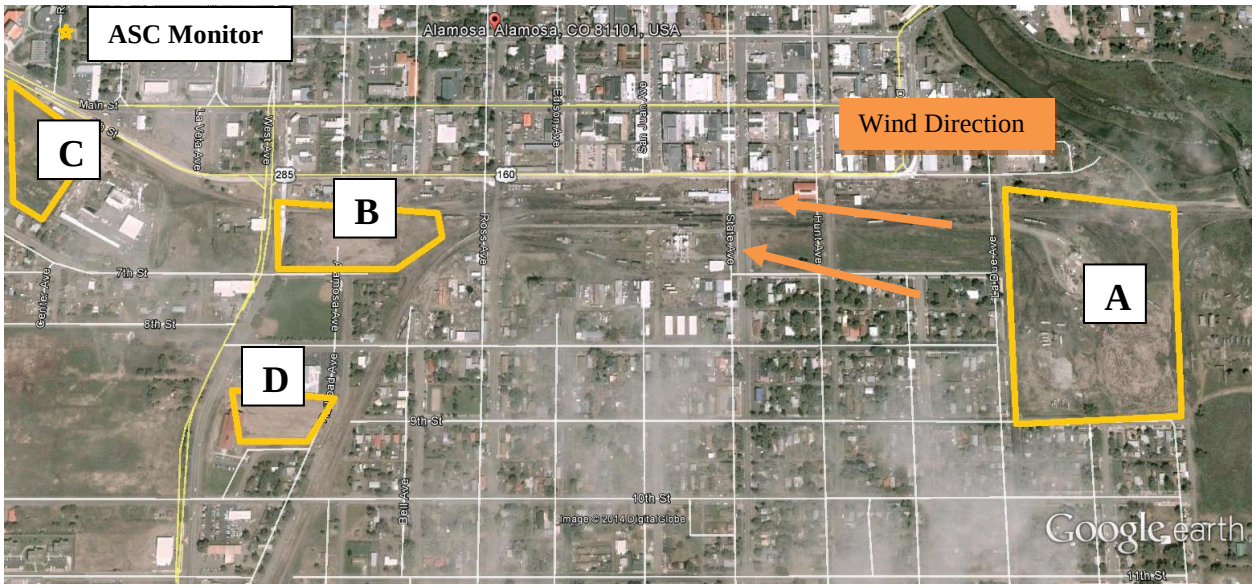


Figure 36: Southeast of Alamosa State College PM10 Monitor (~1mile distance) and potential disturbed soil. (Google Image 2007)

Site A in Figure 36 (approximately 22 acres) is east of La Due Ave, south of 6th St., north of 9th St., and west of Old Airport Rd. It is zoned by the city as "Commercial Business" and "Industrial", as shown in Figure 35. Site A is private property with restricted access located just south of the rail yard. The land is naturally vegetated and undisturbed as shown in Figure 37.

Figure 37: Site A (CDPHE, August 2013)

Site B in Figure 36 (approximately 5 acres) is south of 6th St, west of Ross Ave, east of West Ave, and north of 7th St. It is zoned by the city as "Commercial Business" as shown in Figure 35. The vacant land is undisturbed gravel, dirt, and weeds as shown in Figure 38. The railroad runs through the land rendering it unlikely to be developed in the future.

Figure 38: Site B (CDPHE, August 2013)

Site C in Figure 36 (approximately 22 acres) is south of Highway 160 and north east of Tremont St. It is zoned outside of the city's limits by the city as a "Parcel" as shown in Figure 35. As shown in Figure 39 Site C is a naturally vegetated and minimally (if at all) disturbed soil area.

Figure 39: Site C (CDPHE, August 2013)

Site D in Figure 36 (approximately 3 acres) is east of West Ave, north of 10th St, south of 8th St, and west of Railroad Ave. It is zoned by the city as "Commercial Business" as shown in Figure 35. Site D is "Friends" Park that is maintained by the City of Alamosa. Figure 40 shows that Friends Park has a well maintained gravel parking lot, a cement basketball court, an irrigated field, and a small hard packed clay BMX bike dirt track. The park is well maintained by the City and implements reasonable dust control measures on a regular basis.

Figure 40: Site L- Friends Park (CDPHE, August 2013)

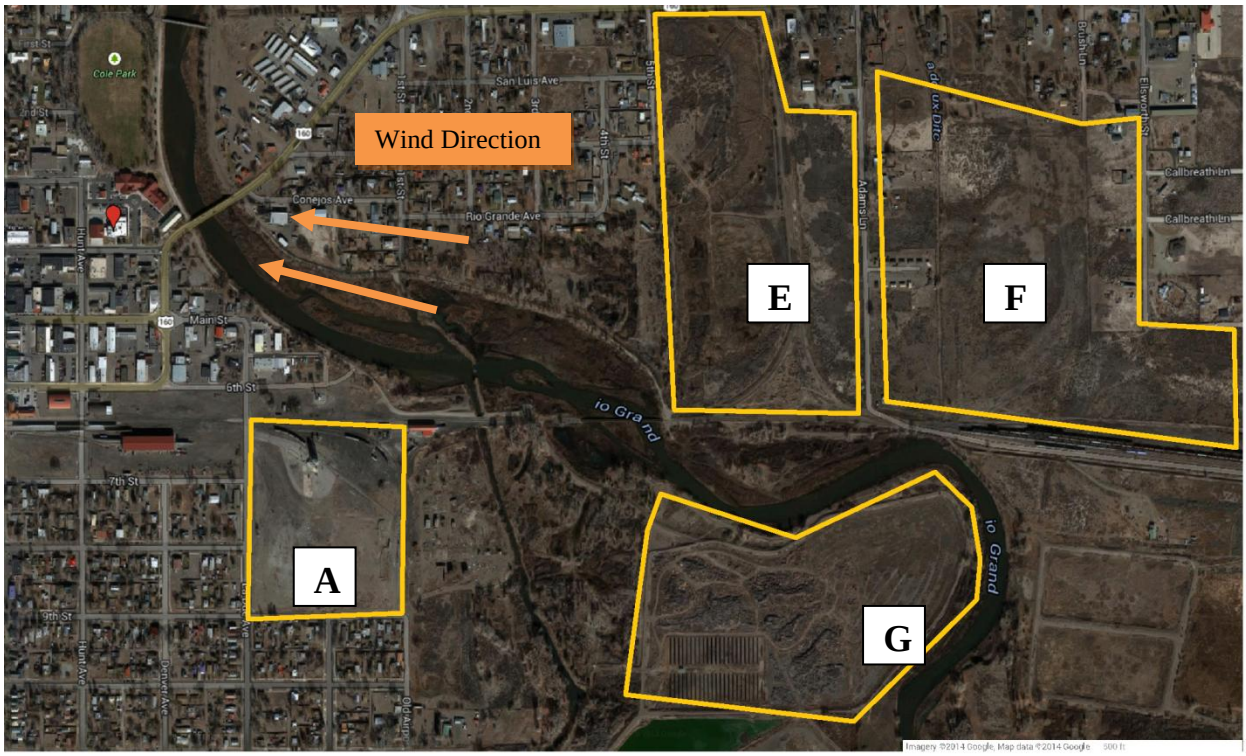


Figure 41: Southeast of Alamosa State College PM10 Monitor (~2mile distance) and potential disturbed soil. (Google Image 2014)

Site E in Figure 41 (approximately 20 acres) is a vacant lot that is for sale as of August 2013. The undisturbed land is fenced in with barbed wire. The land is in a heavily wooded area and has dense natural vegetation as shown in Figure 42.

Figure 42: Site E (CDPHE, August 2013)

Site F in Figure 41 is all private undisturbed land (multiple owners) that is fenced in with barbed wire. The land has dense natural vegetation as shown in Figure 43.

Figure 43: Site F (CDPHE, August 2013)

Site G in Figure 41 is a solar farm surrounded by open naturally vegetated land. Access to the solar farm is very restricted; the road to the facility is private and gated. The solar farm and adjacent vacant land is shown in Figure 44.

Figure 44: Site G (CDPHE, August 2013)

The APCD conducted thorough assessments to determine if the potential soil disturbances shown in Figure 34 through Figure 44 were present during the 2012 exceedance in Alamosa. During the course of these assessments, the APCD discovered that these sites were either reasonably controlled or considered to be natural sources during the April 2, 2012, high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Alamosa area during the April 2, 2012, high wind event.

Sod and Vegetative Projects in the County

The development and construction of a local park, Eastside Park, is complete in Alamosa County. It has been completed with turf grass, shrubs, and landscape rock. No exposed soil remains.

Numerous other projects to reduce blowing dust and its impacts have happened or are happening at the County Airport. For example:

- Through additional grounds maintenance of the 40-acre Alamosa County airport south of the city, "Xeriscape" has been installed for aesthetics and dust control.
- Decorative rock and xeriscape have been implemented in the landscaping of the Alamosa County property (2007-2012). These measures have directly abated blowing dust at the Airport.
- Also, the widening of the airport's safety areas (250 feet on either side of the runway) is complete and seeding of natural grasses was incorporated in the

project. Trees and grass were incorporated in the approaches to the airport and have provided additional wind-break advantages to South Alamosa.

In other areas where watering is a problem, xeriscape (the use of native drought resistant vegetation and/or rock cover) is being encouraged for County owned property and for all other property owners.

Colorado State University Co-Op Extension Office

In response to extremely dry conditions, the need to maintain area topsoil, and reduce impacts, the Colorado State University Co-Op Extension Office of Alamosa County provides the following outreach efforts and recommendations:

- Modification of grazing practices to improve protective crop cover
- Increasing crop residues left in the fields to reduce blowing dust
- Planting of Fall crops to maintain fields
- Application of manure to protect top soils from blowing away
- Staggering of the harvest to minimize blowing dust
- Outreach programs on soil conservation efforts
- Development of outreach/education materials (e.g., news articles, newsletters, fact sheets, etc.), and
- Attendance at Statewide workshop to educate other Co-Op offices to various practices to reduce blowing top soil and minimize impacts.

These control strategies are not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Natural Resources Conservation Service (NRCS)

Alamosa County is a predominately agricultural area where limited water, coupled with the frequent high winds experienced during late fall and early spring, can destroy crops, encourage pests, and damage soil surfaces lending them susceptible to wind erosion. Thus, activities that improve the topsoil and prevent its lifting during high wind events are encouraged. Some notable NRCS and agricultural examples include:

- Local Conservation Districts and farmers hold monthly meetings as an informal Soil Health Group, discussing ways to improve soil health. Cover crops, compost applications, and reduced tillage are the targeted practices. Public tours are held twice a year.
- NRCS continues to work with area farmers in the development of conservation compliance plans to also protect topsoil;
- NRCS encourages planting perennial grasses or the leaving weeds undisturbed or mowed on the corners of center pivots (instead of tilling that might lead to open, barren lands) to reduce soil blowing;
- NRCS “cost shares” on soil health practices and perennial grass seeding conservation practices with local farmers to prevent soil erosion, and;
- The NRCS is working with Colorado State University, local Water Conservation District, and Farm Service Agency to encourage retirement of marginal cropland in

the Conservation Enhanced Reserve Program (CREP) and seeding those acreages back to native grass, forbs and shrubs.

Other successful agricultural practices encouraged in the area include: timing of tillage, crop rotation, amount of crop residue left on the land, and proper water usage. These control strategies are not meant to be enforceable. They are meant only to demonstrate the regional nature of cooperation in addressing blowing dust and its impacts on the community.

Please refer to the Final NEAP for Alamosa at: http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=AlamosaNaturalEventsActionPlan2003.pdf for more detail if needed.

5.3 Lamar

Natural Events Action Plan (NEAP)

In response to exceedances of the PM_{10} NAAQS (two in 1995 and one in 1996), the APCD, in conjunction with the City of Lamar's Public Works Department, Parks and Recreation, and Prowers County Commissioners, the Natural Resources Conservation Services, the Burlington Northern Santa Fe Railroad, and other agencies developed a Natural Events Action Plan. That Plan was presented to EPA in 1998 and subsequently approved. Since 1998, it is this plan that has assisted the area in addressing blowing dust due to uncontrollable winds.

The most recently updated NEAP for High Wind Events in Lamar, Colorado was completed in 2012. The NEAP addresses public education programs, public notification and health advisory programs, and determines and implements Best Available Control Measures (BACM) for anthropogenic sources of windblown dust in the Lamar area. The City of Lamar, Prowers County, the APCD, and participating federal agencies worked diligently to identify contributing sources and to develop appropriate BACM as required by the Natural Events Policy.

Please refer to the Final NEAP for Lamar, available at http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=LamarNaturalEventsActionPlan2012.pdf for more detail if needed.

Control Measures from the December 2012 Maintenance Plan

Control of Emissions from Stationary Sources
Although there are few stationary sources located in the Lamar attainment/maintenance area, the State's comprehensive permit rules listed in Table 10 will limit emissions from any new source that may, in the future, locate in the area.

The EPA approval of the original PM_{10} Maintenance Plan, effective on 11/25/2005, reinstates the prevention of significant deterioration (PSD) permitting requirements in the Lamar Attainment/Maintenance area. The federal PSD requirements apply to new or modified major stationary sources which must utilize "best available control technology" (BACT).

Federal Motor Vehicle Emission Control Program (FMVECP)
The FMVECP has reduced PM_{10} emissions through a continuing process of requiring diesel engine manufacturers to produce new vehicles that meet tighter and tighter emission standards. As older, higher emitting diesel vehicles are replaced with newer vehicles through fleet turnover; tailpipe PM_{10} emissions in the Lamar area will be further reduced.

Voluntary and State-Only Measures
Additional activities in Lamar that result in the reduction of PM_{10} emissions include:

- The City of Lamar has historically cleaned their streets in town throughout the winter and spring using street sweepers. The frequency of this voluntary effort is determined by weather. As of October 2013, the Public Works Director informed APCD that the streets are swept on a weekly basis unless there is snow on the streets.
- The City of Lamar and immediately surrounding areas require that new developments have paved streets. As of October 2013, the City's Planning Commission is been working on making this an official city ordinance. In the past, it has been required despite the lack of official rule.

State Implementation Plan Measures
Any owner or operator responsible for the construction or maintenance of any existing or new unpaved roadway which has vehicle traffic exceeding 200 vehicles per day in the Lamar attainment/maintenance area and surrounding areas must stabilize the roadway in order to minimize fugitive dust emissions. These statewide requirements are defined in detail in the AQCC's Regulation No. 1 as listed in Table 10.]

City of Lamar

The City of Lamar has been very proactive in addressing potential PM_{10} sources within the Lamar area including the application of grass turf at baseball fields, implementing and enhancing a street sweeping program, and chip-seal paving of many unpaved roads. The City of Lamar - Public Works Department has implemented the following BACM controls within the area:

1. *Wind Break*
Beginning in the spring of 1997, a wind break of trees was planted north of the Power Plant monitoring site (080990001). The Russian Olive tree wind break is located approximately one half mile north of the Power Plant monitoring site and will block potential contributing blowing dust sources such as the Lamar Transfer Station and other unpaved equipment traffic areas to the north. The Russian Olive is a quick growing large shrub/small tree that thrives despite the semi-arid and windy climate of Lamar. As of October 2013, the Public Works Director states that most of the trees are still alive and in place. According to section 3.5.2.1 of EPA guidance entitled "*Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures*", dated September 1992, one-row of trees is considered an effective windbreak.

In addition to the plantation of tree wind breaks, a drip irrigation system has been installed to promote sustained tree growth. In October 2013, the Public Works Director stated that the drip system is still operational but due to the drought the City has been on strict water restrictions.

2. *Landfill Controls*
The East Lamar Landfill is located approximately six (6) miles east of the city limits. The landfill has a CDPHE Permit (#09PR1379) which specifies that visible emissions shall not exceed twenty percent (20%) opacity during normal operation of the source and that fugitive PM_{10} cannot exceed 5.77 tons per year. The permit also contains a Particulate Emissions Control Plan that states that:

- No off-property transport of visible emissions shall apply to on-site haul roads.
- There shall be no off-property transport of visible emissions from haul trucks.
- All unpaved roads and other disturbed surface areas on site shall be watered as often as needed to control fugitive particulate emissions.
- Surface area disturbed shall be minimized.
- Exposed land areas to be undisturbed for more than six months shall be revegetated.

According to section 3.5.1 of the "Operations and Closure Plan for the East Lamar Landfill", the Director of the Public Works Department and/or the landfill operator is required to do the following litter control measures under high wind conditions:

- Soil cover is required to be placed on the working face of the landfill daily during periods of wind in excess of 30 mph; and,
- The landfill must be closed down when sustained winds reach 35 mph or greater.

An on-site wind gauge monitors wind speed at the landfill. Operators have radios in their equipment connecting them with the main office so that when the decision to close the landfill is made, it can take place immediately. According to the Director of Public Works, landfill operators have been directed to close the landfill at their discretion. Because trash debris (paper) begins to lift and blow into the debris fences at wind speeds of 25 to 30 mph, the operator usually closes the landfill prior to wind speeds reaching 30 mph. The City of Lamar has agreed to make the closure of the Lamar landfill mandatory when wind speeds reach 30 mph, which reduces windblown dust from the landfill as earth moving activities are reduced or eliminated during periods of shut down. In October 2013, the Public Works Director stated that all of these practices are still enforced.

In addition, the placement of chain link fencing and various debris fences have been added to the previous litter entrapment cage. These additional fences better minimize the release of materials during high wind conditions. The Public Works Director states that this is a dynamic process; as the debris moves, the fences are moved too.

3. *Vegetative Cover/Sod*
The Lamar Recreation Department installed 100,000 square feet of turf sod at a recreational open space called Escondido Park in the early 2000s. Escondido Park is located in northwest Lamar at 11th and Logan Streets. A sprinkler system has also been installed by the Parks and Recreation Department. The sod provides a vegetative cover for the open area. This dense turf cover provides an effective control against windblown soil from the open area of the park.

In addition, the Lamar Public Works Department stabilizes the entrance road leading to and from Escondido Park with chemical soil stabilizer and chip-seal to reduce dirt tracked out onto city streets and minimize additional releases of PM_{10}. This is done on an as needed basis.

4. *Additional Public Works Projects*
The Public Works Department implemented the following projects to further reduce emissions of PM_{10}:

- The purchase of a TYMCO regenerative air street sweeper (May 2001) which is much more effective in reducing dust during street sweeping activities. The use of this sweeper allows for improved cleaning of the streets (e.g., sweeps the gutter and street);
- The fencing of an area around the City Shop at 103 North Second Street in 2011 to reduce vehicle traffic that may be responsible for lifting dust off of the dirt area between the railroad tracks and the Shop;
- The stabilization of a large dirt and mud hole in 2008on the north side of the City Shop by installing a curb and gutter that allows for better drainage. This project is credited with keeping mud from being tracked out into the street and becoming airborne by vehicular traffic;
- The ongoing commitment to search for other stabilization projects that benefit the community and improve area air quality, and;
- The relocation of the Municipal Tree Dump in the early 2000s (formerly located in the northeastern corner of the city) to approximately six miles east of the city (now housed at the Municipal Landfill). This relocation eliminates a major source of smoke from agricultural burns that may have previously affected the community.

Regulatory Measures - City

Lamar has an ordinance that requires that all off-street parking lots shall have a dust-free surface to control PM_{10} emissions (City of Lamar Charter and Code, ARTICLE XVII, Sec. 16-17-60).

Burlington-Northern/Santa Fe Rail Line

The rail line running east-west of the Lamar Power Plant monitoring site was deemed to be an important PM_{10} source during conditions of high winds and low precipitation. Ground disturbance from vehicle traffic, which damages vegetation and breaks-up the hard soil surfaces, resulted in re-entrainment of dust from traffic, high winds or passing trains. This area is problematic in the two block area immediately west of the Power Plant monitoring site as shown in Figure 46 as Site F. Control of this open area requires a close working agreement between the Burlington-Northern/Santa Fe Railroad Company (BNSF) and the City of Lamar Public Works Department. The purpose of this BACM is to reduce the amount of particulate matter susceptible to wind erosion under high wind conditions and general re-entrainment of dust in the ambient air as a result of local train traffic passing in close proximity of the PM_{10} monitor.

In September 1997, the City chemically stabilized exposed lands north of the rail line between Fourth and Second Street where there was evidence of vehicle traffic. All other lands on either side of the rail road tracks between Main Street (Fifth) and Second Street and extending westward have either natural, undisturbed ground cover or it is used for commercial/recreation purposes that do not allow for significant re-entrainment (BNSF is responsible for maintaining 50 feet of property on either side of the main track). Most of these lands are leased by the City. After September 1997, the City negotiated the lease of these lands. Once acquired, a long term plan, will be developed for these lands such as restricting vehicle access, permanently stabilizing lands with vegetation and gravel,

increasing park and recreational use, and using the lands for city maintenance and storage activities. In October 2013, the Public Works Director stated that gravel has been periodically added to minimize blowing dust.

According to the Manager of Environmental Operations for BNSF, the railroad company owns the main rail line and 200 feet on either side of the track. Much of this property has been sold or leased under private contracts. At this time BNSF is responsible only for the main rail line and for 50 feet of property on either side of the main track. All property sold or under contract is not the responsibility of BNSF. As a result, BNSF has stabilized the railroad corridor 50 feet on either side of the main rail line.

In May 1997, BNSF placed chips (gravel) 50 feet on either side of the main track from Main Street to Second Street (three blocks) to control fugitive dust emissions from this section of the track. Graveling exposed surfaces not exposed to regular vehicle traffic is considered a permanent mitigation measure. Details of this arrangement can be found in the documentation under the 1998 SIP Maintenance Plan submittal.

Prowers County

Prowers County Land Use Plan:

Beginning in 1997, Prowers County with the assistance of local officials, environmental health officers and the general public began preparing a county land use plan. The Prowers County Land Use Plan is designed to have wide-reaching authority over the myriad of land use issues involving building (construction sites), siting, health, fire, environmental codes, and other social concerns associated with the City of Lamar and Prowers County. The county land use plan, entitled "*Guidelines and Regulations for Areas and Activities of State Interest – County of Prowers – State of Colorado*", was adopted on April 19, 2004 and amended on August 17, 2006. The plan incorporates provisions to minimize airborne dust including re-vegetation of disturbance areas associated with land development. The Prowers County Land Use Master Plan can be found on the County's website at: http://www.prowerscounty.net.

Regulations and ordinances of the Land Use Plan specific to reducing blowing dust and its impacts include:

- Additional regulations on development of fragile lands and vegetation to protect topsoil;
- Development of performance standards and best management practices to prevent soil erosion;
- Development of best management practices to reduce blowing sands and movement of area sand dunes across the county;
- Development of new special use permits to address the siting of animal feedlots and feed yards;
- Development of special use permits for other future stationary sources. The special use permits will also likely include the requirement for comprehensive fugitive dust control plans for both construction and operation of facilities;
- Consideration and review of enforcement capabilities through the area zoning ordinances, and;
- Planned public review and comment processes following the legal update of the draft County Land Use Plan.

Windblown Dust from Disturbed Soils

The City of Lamar is located in Prowers County in southeastern Colorado. Situated along the Arkansas River and near the Kansas border, Lamar serves as the largest city and the agricultural center for southeast Colorado. The area surrounding Lamar consists of gently rolling to nearly level uplands where the dominant slopes are less than 3 percent. The climate is generally mild and semiarid. Annual precipitation is about 15 inches. Summers are long and have hot days and cool nights. In winter and spring, windstorms are common, especially in drier years. It is due to these high velocity dust storms and drought conditions that Lamar experiences most of the PM_{10} problems for the area. Figure 45 through **Error! Reference source not found.** illustrate potential areas of local soil disturbance that have been evaluated by the APCD for the Lamar Municipal PM_{10} monitor (080990002).

Figure 45: Wind Direction relative to Lamar Municipal PM_{10} monitor for the April 2, 2012 event. (Google Earth August 2012)

Figure 46: Relative positions of Lamar Municipal PM_{10} Monitor and potential disturbed soil (~1 mile distance). (Google Earth 08/2012)

Site A in Figure 46 is west of the Lamar PM_{10} monitor at 200 N 4th St. This is owned by "Heath & Son & Turpin Trucking", a company that repairs large trucks and shared with "HVH Transportation Inc", a freight service trucking company. This site consists of well maintained gravel. The APCD considers maintained gravel and limited access to be the appropriate available and practical method for a small site of this size in this area of Colorado that has been designated a drought area for years, is in an economic recession, and is owned by multiple small businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site B in Figure 46 is west of the Lamar PM_{10} monitor. The site is shared by a few businesses. All businesses have restricted access by fences surrounding the property. "Cowboy Corral Storage" at 102 North 4th St is one of the businesses on the lot. It has a very small gravel parking lot and is no longer in business according to the previous owner as of October 2013. The storage company has a small gravel parking lot with access being restricted by a security fence as shown in Figure 47. The lot is also shared with the "Prowers Area Transit" county bus

garage. The bus garage is very small, only four bays. The garage has a concrete slab that runs to the asphalt road to avoid the busses driving on the gravel in order to mitigate fugitive dust. The gravel lot is watered on an as needed basis. The other business is an old feed supply company with grain storage as shown in Figure 48. The feed supply company is out of business and the grain elevators are not being utilized. The APCD considers maintained gravel and limited access to be the appropriate available and practical method for a small site of this size in this area of Colorado that has been designated a drought area for years, is in an economic recession, and is owned by multiple small businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Figure 47: Cowboy Corral Storage (Google Image 2012)

Figure 48: Feed Storage Company (Google Image 2012)

Site C in Figure 46 is west of the Lamar PM_{10} monitor at about 201 N 2nd Street. The gravel parking lot on site is owned by "Heath & Son & Turpin Trucking" and is shown in Figure 49. The lot is used to store trucks when not in use. This site consists of well maintained gravel. The APCD considers maintained gravel and limited access to be the appropriate available and practical method for a small site of this size in this area of Colorado that has been designated a drought area for years, is in an economic recession, and is owned by multiple small businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Figure 49: Heath & Son & Turpin Trucking Storage Lot (Google Image 2012)

Site D in Figure 46 is west of the Lamar PM_{10} monitor at about 103 North 2nd Street. It is the "Lamar Water Department". Also on site D is the "Lamar-Prowers County Volunteer Fire Department" at 300 E Poplar Street. Both sites have restricted access with security fences. The City of Lamar maintains their gravel lots by grating and watering them on an as needed basis. The APCD considers maintained gravel. limited access, grating, and watering to be the appropriate available and practical method for a small site of this size in this area of Colorado that has been designated a drought area for years, is in an economic recession, and is owned by multiple small businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site E in Figure 46 is the power plant that the Lamar PM_{10} monitor is located within at100 North 2nd Street. "Lamar Light and Power" historically operated a natural gas-fired boiler that produced steam for a 25 MW turbine/generator set. This boiler was constructed prior to 1972 and was grandfathered from construction permitting requirements. In the early 2000s, factors such as increasing costs of natural gas made the plant uneconomical to run. As a result, Lamar Light and Power purchased power and ran the natural gas-fired boiler very infrequently or not at all. In February 2006, the APCD issued a permit for Lamar Light and Power to replace the existing natural gas-fired boiler with a coal-fired circulating fluidized bed (CFB) boiler rated at approximately 42 MW. The conversion prompted legal challenges from Lamar residents partnered and WildEarth Guardians, a New Mexico-based environmental group. Lamar Light and Power settled and agreed to shut down the coal-fired power plant. The power plant was shut down on November 11, 2011. The settlement also calls for the plant to stay offline until at least 2022, when the current agreement to supply electricity to Lamar and other communities expires.

"Lamar Light and Power" has an air quality permit (CDPHE # 05PR0027). The permit includes the following point and fugitive dust control measures:

- Limestone and ash handling, processing, and storage are controlled by high efficiency baghouses.
- Water wash-down-systems are used for flushing down any accumulated dust on walkways, platforms, and other surfaces to prevent re-entrainment of the dust into the atmosphere.
- On-site haul roads are paved, and these surfaces are inspected at least once each day in which hauling activities occur, and cleaned as needed. Various cleaning methods are used depending on the extent of dust accumulations. These activities emit less than 1 ton per year of PM_{10} and are APEN Exempt.
- All transport vehicles containing substances that potentially generate fugitive particulate matter emissions (such as trucks containing limestone, inert material, or ash) are fully enclosed, or covered with a mechanical closing lid or a tight tarp-like cover at all times while on the facility grounds except during loading / unloading operations.
- Emissions from emergency coal stockpile are effectively controlled with a water dust suppression system.

Access to the power plant is restricted by security fences. The APCD considers the enforceable conditions of the permit, including identified Best Available Control Technology (BACT) for limestone and ash handling, paving, wash-down systems, and enclosures, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site. The winds speeds on April 2, 2012 did exceed the blowing dust thresholds of 30 mph or greater and gusts of 40 mph or greater at which the APCD expects stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed (wind speeds were as high as 35 mph with wind gusts up to 54 mph).

Site F in Figure 46 is the Burlington Northern Santa Fe railroad that runs past the Lamar PM_{10} monitor to the south. On either side of the rail road tracks is gravel as shown in Figure 50. In May 1997, Burlington Northern Santa Fe placed chips (gravel) 50 feet on either side of the main track from Main Street to Second Street (three blocks) to control fugitive dust emissions from this section of the track. Graveling exposed surfaces not exposed to regular vehicle traffic is considered a permanent mitigation measure. Also, all the train tracks are raised up on 3 inch diameter rock and tracks. Areas that are not used by the railroad are allowed to be naturally vegetated with Xeriscape. With regard to AQCC Regulation 1 requirements (Section III.D), the APCD considers gravel and 'Xeriscape' vegetation to be the appropriate available and practical method that is technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this type of source.

Figure 50: Railroad tracks with gravel on each side (Google Image 2012)

Site G in Figure 46 is Colorado Mills LLC a facility that produces sunflower oil and processes the leftover solids combined with grains and additives into feed that used locally for cattle and hogs. APDC issued the initial permit 95PR622 for this facility in 1996 to Cargill, Inc. A final approval permit and two transfers of ownership have since been issued in 1997, 1999 and 2000 respectively and the facility is now owned and operated by Colorado Mills, LLC. The permit includes the following point and fugitive dust control measures:

- Visible emissions shall not exceed 20% opacity during normal operations and 30% opacity at all other times.
- Permit limits on Particulate Matter
- Requirement to follow the developed Operation and Maintenance plan

This Facility was inspected by the APCD on 2/14/12 and no visible emissions were observed. Records review revealed that Colorado Mills has been in compliance with their permitted emission limits. An Operating and Maintenance Plan was submitted to the APCD for this facility on November 21, 1996 and approved by the APCD on December 24, 1996. The General Manager of the facility stated during the inspection that Colorado Mills conducts monthly inspection and maintenance on process and control equipment at the facility and no evidence was observed during the inspection to suggest that process and control equipment at the facility are not operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions. Additionally, particulate emissions from oil extraction activities, grinding of grains, extruding and materials conveyance are controlled by several cyclones. The APCD considers the enforceable conditions of the permit, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site.

Site H in Figure 46 is southwest of the Lamar PM_{10} monitor. It is located at about 356 South 4th Street. Part of the property is owned by Century Link. Century Link has a storage lot for fleet vehicles that is well maintained gravel. Access to the storage lot is restricted by a fence as shown in Figure 51. A large part of site H is a free public gravel parking lot for the Prowers County Jail and the Prowers County Municipal Court as shown in Figure 52. The lot is

maintained by the County. The parking lot is chip sealed and covered in crushed gravel. Site H, as shown in Figure 51, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers maintained gravel and limited access to be the appropriate available and practical method for a small site of this size in this area of Colorado that has been designated a drought area for years, is in an economic recession, and is owned by multiple businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Figure 51: Site H- Century Link Fleet Storage Lot (Google Image 2012)

Figure 52: Site H- Parking lot for the Prowers County Jail and the Prowers County Municipal Court (Google Image 2012)

Site I in Figure 46 is located to the north of the Lamar Power PM_{10} monitor on the northeast corner of Washington St and 4th St. Site I is at 310 E Washington St. The site used to be "Big R Warehouse" but is currently owned by Prowers County and is rented out to the Colorado State Patrol for office space. The lot is covered in gravel for dust suppression, drainage, and erosion control. Within the lot, vehicle speeds are restricted to 5 mph. Access to the lot is restricted by a chain link fence. The lot is watered on an as needed basis. Site I, as shown in Figure 53, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted vehicle speeds in combination with maintained gravel and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Figure 53: Site I, 310 E Washington St., Lamar (Google Image August 2012)

Site J in Figure 46 is located to the north of the Lamar Power PM_{10} monitor. Site J is "Ranco", a heavy duty construction trailer manufacturing company located at 700 Crystal St. All of the property owned by Ranco is pavement, gravel, or natural vegetation. The company informed CDPHE that there are no unnatural, disturbed, areas of dirt on the property that could contribute to the issue of blowing dust. The APCD considers pavement, maintained gravel, natural vegetation, and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site K in Figure 46 is Valley Glass, located at 201 east Washington St., Lamar. Valley Glass does commercial and residential glass work including storefronts, windows, siding and railings. The property has restricted access and a well maintained gravel parking area (Figure 54). The APCD considers pavement, maintained gravel, natural vegetation, and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

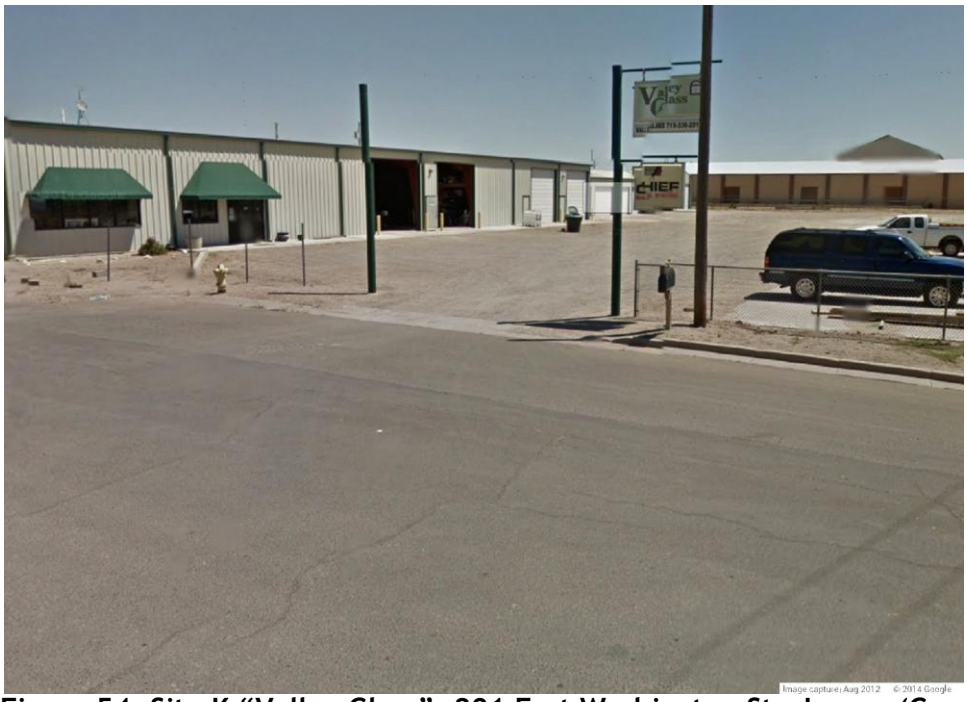


Figure 54: Site K "Valley Glass", 201 East Washington St., Lamar (Google Image August 2012)

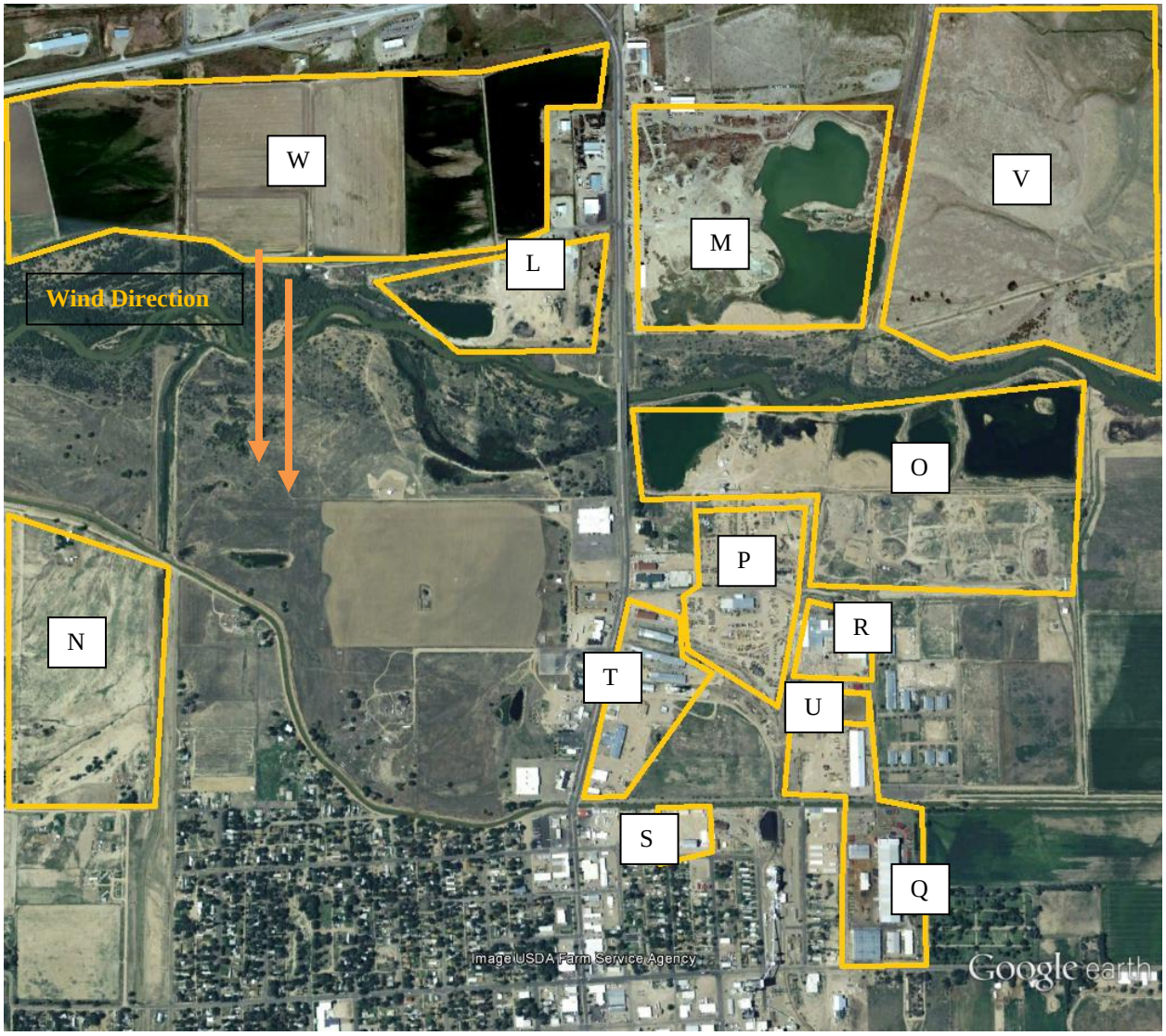


Figure 55: Relative positions of Lamar Municipal PM_{10} Monitor and potential disturbed soil (further north). (Google Earth August 2012)

Site L in Figure 55 is located to the northwest of the Lamar Power PM10 monitor. Site L is "All-Rite Paving and Redi-Mix Inc" at 200 Speculator Ave. This is a concrete batch plant with a permit from CDPHE (#12PR1396). However, this facility is considered APEN exempt and emits less than 1 ton per year of PM10. This facility has a PM baghouse collection efficiency of 99%. Water spray and magnesium chloride is used on storage piles and all unpaved roads as needed. The unpaved roads at site L are covered with gravel and the vehicle speed is restricted to 10 mph at all times. The transfer of aggregate to storage bins and trucks is entirely conducted in enclosed areas. All aggregate is washed prior to storage in order to reduce dust emissions. The APCD considers the enforceable conditions of the permit, including identified continuous controls such as gravel roads with miles per hour restrictions and enclosures, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site. The winds speeds on April 2, 2012 did exceed the blowing dust thresholds of 30 mph or greater and gusts of 40 mph or greater at which the APCD expects stable surfaces (i.e., controlled anthropogenic and

undisturbed natural surfaces) to be overwhelmed (wind speeds were as high as 35 mph with wind gusts up to 54 mph).

Site M in Figure 55 is mined by "Carder Inc" and is located to the northwest of the Lamar Power PM10 monitor. Carder Inc mines for sand and gravel primarily for road construction. This site has a permit from CDPHE (#99PR0180F) and emits approximately 15 tons per year of PM10. This is a wet mining operation so it produces minimal fugitive dust. The dust control measures that are part of the permit include watering the disturbed area as needed, revegetation within one year of disturbance, compacting of piles, mining moist materials, vehicles cannot exceed 10 mph on site at all times, and temporary roads are covered with gravel and watered as needed. The APCD considers the enforceable conditions of the permit, including identified continuous controls such as gravel roads with miles per hour restrictions, compaction, revegetation, watering, and extraction limitation, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site. The winds speeds on April 2, 2012 did exceed the blowing dust thresholds of 30 mph or greater and gusts of 40 mph or greater at which the APCD expects stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed (wind speeds were as high as 35 mph with wind gusts up to 54 mph).

Site N in Figure 55 is restricted access property located just south of the Lamar Canal Road and west of N 13th St. The land is naturally vegetated and undisturbed as shown in Figure 56.

Figure 56: Site N (Google Image 2014)

Site O in Figure 55 is located to the north of the Lamar Power PM10 monitor. Site O is mined by "All-Rite Paving and Redi-Mix Inc" at 1 Valco Road. This is a concrete batch plant with a permit from CDPHE, (#85PR108). However, this facility is considered APEN exempt and emits less than 1 ton per year of PM10 This facility has a PM baghouse collection efficiency of 99%. Visible emissions from this source shall not exceed 20% opacity. Water sprays and magnesium

chloride are used on storage piles and all unpaved roads as needed. The unpaved roads at site E are covered with gravel and the vehicle speed is restricted to 10 mph at all times. The transfer of aggregate to storage bins and trucks is entirely conducted in enclosed areas. All aggregate is washed prior to storage in order to reduce dust emissions. Access to the site is restricted by a fence. The APCD considers the enforceable conditions of the permit, including identified continuous controls such as gravel roads with miles per hour restrictions and enclosures to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site. The winds speeds on April 2, 2012 did exceed the blowing dust thresholds of 30 mph or greater and gusts of 40 mph or greater at which the APCD expects stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed (wind speeds were as high as 35 mph with wind gusts up to 54 mph). Additionally, the City of Lamar took over the concrete plant in the spring of 2013 and is in the process of reseeding it and turning the site into a park for fishing and wildlife with motorized vehicles being prohibited. The City of Lamar and the Division of Wildlife are partners in this effort.

Site P in Figure 55 is "Ranchers Supply CO INC" at 400 Crystal Street. The company started in 1961 and their products include used trucks, construction equipment, military vehicles, new and used trailers and other government surplus items. The property is used for inventory storage. To control fugitive dust emissions, onsite vehicle speeds are restricted to 10 mph. The owner states that 90% of the lot is covered in well maintained gravel. The site is watered down on an as needed basis to mitigate dust to protect assets and for pollution prevention. Also, all of the large equipment also acts as a wind block. Access to the site is restricted by a security fence. The site has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted vehicle speeds in combination with maintained gravel to be the appropriate available and practical method that is technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this storage site.

Figure 57: Site P - Ranches Supply CO INC (Google Image August 2012)

Site Q in Figure 55 is located to the north of the Lamar Power PM10 monitor. Site Q is "Ranco", a heavy duty construction trailer manufacturing company located at 700 Crystal St. All of the property owned by Ranco is pavement, gravel, or natural vegetation. The company informed APCD that there are no unnatural, disturbed, areas of dirt on the property that could contribute to the issue of blowing dust. The APCD considers pavement, maintained gravel, natural vegetation, and restricted access to be the appropriate available and practical

methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site R in Figure 55 is located to the north of the Lamar Power PM10 monitor. Site R is "C.F. Maier Composites Inc" at 500 East Crystal Street. This 57,000 square foot facility has been operating since 990 and specializes in highly difficult fiber reinforced composites and OEM component application. C.F. Maier offers product design, development, prototype and full production of reinforced composite parts for high stress or high impact uses. The company has a paved parking lot. The rest of the lot is covered in natural vegetation. There is a short (200 ft.) well maintained gravel road that leads up to the loading dock that gets used on average one a day. Site R, as shown in Figure 55, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted maintained gravel and natural vegetation to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site S in Figure 55 is located to the north of the Lamar Power PM10 monitor on the northeast corner of Washington St and 4th St. Site S is at 201 E Washington St. The site used to be "Big R Warehouse" but is currently owned by Prowers County and is rented out to the Colorado State Patrol for office space. The lot is covered in gravel for dust suppression, drainage, and erosion control. Within the lot, vehicle speeds are restricted to 5 mph. Access to the lot is restricted by a chain link fence. The lot is watered on an as needed basis. Site S, as shown in Figure 55, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted vehicle speeds in combination with maintained gravel and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site T in Figure 55 is Lamar Feed and Grain – White Stone Farms located at 110 Anderson St., Lamar, CO. This animal feed mill was purchased by Wells Fargo Bank in October 2009 and combined with 207 Anderson St., which Wells Fargo Bank foreclosed on in 7/08. Wells Fargo reported that the mill had not operated for several years and would not be operated under the ownership of Wells Fargo Bank. In September 2011, the property was purchased by Lamar Feed and Grain, LLC and recommenced operations. The facility consists of a grain receiving pit, a grain shipping truck loadout station, grain storage, a grain cleaning scalper, and grain handling and milling systems. In November 2000, APCD issued the initial permit for this source (00PR0431) and at the time of this event, Lamar Feed and Grain, LLC was operating under the Final Approval permit issued on 7/21/06. The permit includes the following point and fugitive dust control measures:

- Total PM, PM10 and PM2.5 annual emissions limitations.
- Visible emissions cannot exceed 20%.
- All equipment must be maintained and operated in a manner consistent with good air pollution control practices for minimizing emissions.
- The feed mill must be equipped with a mineral oil spray system for the control of PM emissions.

The APCD considers the enforceable conditions of the permit, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site. The winds speeds on April 2, 2012 did exceed the blowing dust thresholds of 30 mph or greater and gusts of 40 mph or greater at which the APCD expects

stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed (wind speeds were as high as 35 mph with wind gusts up to 54 mph).

Site U in Figure 55 is Dragon ESP, located at 700 east Crystal St., Lamar. This equipment manufacturing facility commenced operation in 1993 and was combined with the Ranco Trailers facility in 2011. The APCD issued a joint permit for these facilities (08PR0603) on 12/21/11 which consist of paint booths and abrasive blasting units. The permit includes the following point and fugitive dust control measures:

- Permitted annual TSP, PM10 and PM2.5 emission limits
- High Volume Low Pressure paint spray guns or other APCD-approved surface coating method must be used to meet PM emission limits
- Paint spray booths shall be equipped with exhaust filters or paint arresters to control PM emissions and shall be maintained per manufacturer's recommendations
- Blasting operations shall be done in a complete enclosure with baghouse filters to control PM emissions and blasting shall be done with doors closed. The baghouse shall be maintained per manufacturer's recommendation.
- Visible emissions shall not exceed 20% during normal operations
- Source must follow the APCD approved O&M plan

The facility was last inspected on 11/9/11 and was found to be in compliance with all the permitted conditions. The APCD considers the enforceable conditions of the permit, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site.

Site V in Figure 55 is restricted access property that lies south of State Highway 196 and north of the Arkansas River, East of Highway 287. The land is naturally vegetated and undisturbed as shown in Figure 58. Figure 58 demonstrates that this site has minimally (if any) disturbed soil as of this writing. The APCD considers pavement, maintained gravel, natural vegetation, and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site

Figure 58: Site V (Google Image August 2012)

Site W in Figure 55 are rotating crop fields located south and west of U.S. Highway 287/U.S. Highway 50. As shown in Figure 59 and Figure 60, the crops in these fields are rotated from year to year, allowing fields to lay fallow between plantings.

Figure 59: Site W – Rotating crop fields 6/2005. (Google Earth Image June 2005)

Figure 60: Site W – Rotating crop fields 8/2011. (Google Earth Image August 2011)

Site X in Figure 61 is the Robins Redi-Mix Concrete Batch Plant located at 7355 State Highway 196. This batch plant opened in the spring of 2010 and consists of a dry truck mix plant that utilizes a cement and a dry ash silo each of which are operated with pneumatic conveyors and bag houses for the control of emissions. According to Robins Redi-Mix, the bag houses control 98% of the emissions. In April 2010, APCD issued a permit exempt letter for this source (10PR1310.XP). The permit includes the following point and fugitive dust control measures:

- Uncontrolled total PM cannot exceed 10tpy and uncontrolled PM10 cannot exceed 5tpy.
- Visible emissions cannot exceed 20%.

In addition to these permitted requirements, the source reported in their application that they moisten materials throughout their processes and prior to transferring on an as needed basis and have placed gravel on the road to minimize emissions. The APCD considers the enforceable conditions of the permit, including identified Best Available Control Technology (BACT) for limestone and ash handling, paving, wash-down systems, and enclosures, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site. The winds speeds on April 2, 2012 did exceed the blowing dust thresholds of 30 mph or greater and gusts of 40 mph or greater at which the APCD expects stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed (wind speeds were as high as 35 mph with wind gusts up to 54 mph).

Figure 61: 4.5 miles North of Lamar Municipal PM10 Monitor- "Robins Redi-Mix Concrete Batch Plant"- 7355 State Highway 196 Lamar, CO (Google Earth 2012)

The APCD conducted thorough assessments to determine if the potential soil disturbances shown in Figure 45 through **Error! Reference source not found.** were present during the 2012 exceedance in Lamar. During the course of these assessments, the APCD discovered that these sites were either reasonably controlled or considered to be natural sources during the April 2, 2012, high wind event. Therefore, these sites were not significant contributors to fugitive dust in the Lamar area during the April 2, 2012, high wind event.

Colorado State University CO-OP Extension Office

While the following initiatives are not meant to be enforceable, the CSU Co-Op Extension Office has many efforts underway that further reduce blowing dust and its impacts. These include:

- Crop residue efforts that encourage no- or low-till practices. These have been deemed appropriate and useful in reducing blowing dust.

- Ongoing outreach efforts to educate area agricultural producers on soil management programs. These include one-on-one visitations and annual meetings with various corn and wheat programs to discuss crop management.
- Drought workshops to protect topsoil throughout the county.

USDA: Natural Resources Conservation Service (NRCS)

1. *Conservation Reserve Program*

Prowers County is a predominately agricultural area that is made up of 1,048,576 acres of land area – 1,021,915 acres (or 97.5%) of which is land in farms.[2] For comparison, Baca County to the south is 91.9% land in farms, Bent County to the west is 75.0% land in farms, and Kiowa County to the north is 98.4% land in farms. It should be noted that cropland percentage in Bent County is lower than other Southeast Colorado counties at 11%. Figure 62 illustrates the counties of Southeast Colorado. Of the farm land acreage in Prowers County, cropland accounts for approximately half of the total (480,487 acres) and is approximately 46% of the total land in the county. Water, and often the lack of it, coupled with the frequent high winds experienced during late fall and early spring commonly destroy crops, encourage pests, and damage soil surfaces lending them susceptible to wind erosion, especially in recent drought years. Prowers County was classified as being in severe drought in November 2010 and remained so until July 2012 when the county was reclassified as being in an exceptional drought. Prowers County returned to being in a severe drought in October 2014 and remains in this classification. The majority of Prowers County cropland acreage is farmed using dryland practices (versus irrigated) and consists of soils classified as highly-erodible-land (HEL) by the Department of Agriculture.

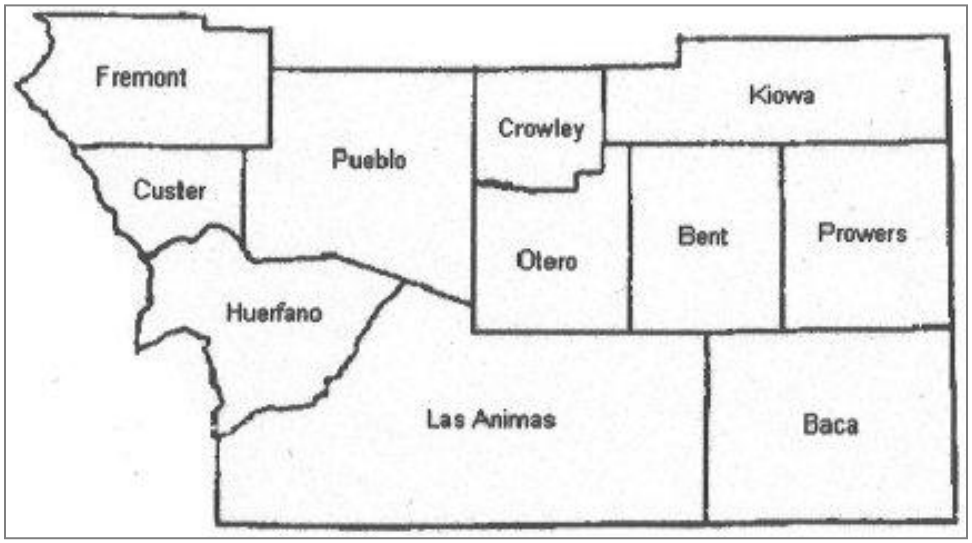


Figure 62: Southeast Colorado Counties

Recognizing the problems associated with erodible land and other environmental-sensitive cropland, the U.S. Department of Agriculture (USDA) included conservation provisions in the Farm Bill. This legislation created the Conservation Reserve Program (CRP) to address these

[2] 2012 Census of Agriculture. Volume 1, Chapter 2: County Level Data. U.S. Dept. Of Agriculture, National Agricultural Statistics Service.

concerns through conservation practices aimed at reducing soil erosion and improving water quality and wildlife habitat.

The CRP encourages farmers to enter into contracts with USDA to place erodible cropland and other environmentally-sensitive land into long-term conservation practices for 10-15 years. In exchange, landowners receive annual rental payments for the land and cost-share assistance for establishing those practices.

The CRP has been highly successful in Prowers County by placing approximately 155,611 acres of Prowers County cropland, or 32% of total cropland, under contract. Most of this land has been planted with a perennial grass cover to protect the soil and retain its moisture.

While the following initiatives are not meant to be enforceable, many efforts are underway that further reduce blowing dust and its impacts. These include:

- The CRP has moved to include all available area lands into area contracts. These contracts are good through 2007. Success of the CRP initiatives is measured through ongoing monitoring of the contracts to ensure ample grass coverage to minimize blowing dust.
- CRP sends out information several times per year through radio and the area newspaper to further reach farmers interested in topsoil protection.
- In response to the significant Colorado drought (2011-2013) the NRCS and FSA are working with multiple parties in extensive annual planning efforts to limit blowing dust and its impacts. These planning efforts change year to year depending on the severity of the drought.

2. *Limestone-Graveyard Creeks Watershed Project*

A watershed improvement project is currently underway in the Limestone-Graveyard Creeks Watershed. This project covers approximately 60,000 acres of land north of the Arkansas River between Hasty (Bent County) and Lamar. An estimated 44,500 acres of the watershed area are classified as priority land due to the highly erodible nature of the soil. Over 2,000 acres of agricultural cropland northwest of Lamar are included in this watershed project. As of 2013, NRCS informed the APCD that this project is approximately 99% complete.

Working with the NRCS, each farmer will create their own conservation plan with costs for improvements split equally between farmers and the federal government. The 15-year project will help reduce soil erosion and improve water quality and efficiency through conservation tillage practices and/or other conservation efforts. In short, the Limestone-Graveyard Creeks Watershed Project will help to reduce soil erosion and lower the impacts of blowing soils during future high wind events.

More recently (since the 1998 NEAP submittal), the Watershed project has been evaluated and is seen as an ongoing successful program as most eligible acres are signed up.

3. *New Initiatives*

While the following initiatives are not meant to be enforceable, the Natural Resources Conservation Service has many efforts underway that further reduce blowing dust and its impacts. These include:

- A comprehensive rangeland management program;
- Tree planting program;

- Drip irrigation purchase program, and;
- A multi-party drought response planning effort coordinated through the State of Colorado Governor's office.
- In 2013, NRCS also tried a proactive approach to drought management by offering producers incentives to mitigate erosion hazard areas before they became an erosion problem.

These are but a few of the efforts at the local, county, and regional level underway to reduce emissions of PM_{10} and limit impacts.

6.0 Summary and Conclusions

APCD is requesting concurrence on exclusion of the PM_{10} exceedance values from Alamosa-Adams State College (08-003-0001) and Lamar Municipal Building (08-099-0002) on April 2, 2012. APCD is also requesting concurrence on exclusion of the elevated PM_{10} value from Lamar Power Plant (08-099-0001) on April 2, 2012.

Elevated 24-hour PM_{10} concentrations were recorded in parts of Colorado on April 2, 2012. All of the noted April 2, 2012, twenty-four-hour PM_{10} concentrations were above the 90th percentile concentrations for their locations (see Table 9). This event exceeded the 99th percentile value for the entire dataset. The statistical and meteorological data clearly shows that but for this high wind blowing dust event, Alamosa and Lamar would not have exceeded the 24-hour NAAQS on April 2, 2012. Since at least 2005, there has not been an exceedance that was not associated with high winds carrying PM_{10} dust from distant sources in these areas. This is evidence that the event was associated with a measured concentration in excess of normal historical fluctuations including background.

The PM_{10} exceedances in Alamosa and Lamar on April 2, 2012, would not have occurred if not for the following: (a) dry soil conditions over the Nebraska panhandle and eastern Colorado with 30-day precipitation totals below the threshold identified as a precondition for blowing dust in the San Luis Valley of south-central Colorado and the plains of eastern Colorado and western Nebraska; and (b) intense surface winds produced by a very tight pressure gradient in the wake of a passing cold front associated with a strong upper-level trough that that was moving across the western United States.

Surface weather maps show evidence of widespread blowing dust and winds above the threshold speeds for blowing dust on April 2, 2012. The combination of intense surface winds produced by a very tight pressure gradient in the wake of a passing cold front, with a strong upper-level trough that was moving across the western United States caused regional surface winds over 40 mph with gusts exceeding 50 mph for several hours. These speeds are above the thresholds for blowing dust identified in EPA draft guidance and in detailed analyses completed by the State of Colorado *(*see Blowing Dust Climatologies available at http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2). These PM_{10} exceedances were due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources over a large area of eastern Colorado and Nebraska. These sources are not reasonably controllable during a significant windstorm under abnormally dry or moderate drought conditions.

The blowing dust climatology for Lamar indicates that the area can be susceptible to blowing dust when winds are high. NOAA HYSPLIT forward and backward trajectories provide clear supporting evidence that dust from arid regions of northeast Colorado and the Nebraska panhandle caused the PM_{10} exceedances measured in Lamar, Colorado and dust from arid regions of eastern Colorado caused the PM_{10} exceedances measured in Alamosa, Colorado on April 2, 2012.

Both wind speeds and soil moisture in Colorado and Nebraska were conducive to the generation of significant blowing dust. Multiple sources of data for the event in question and analyses of past dust storms in this area prove that this was a natural event and, more specifically, a significant natural dust storm originating in the Nebraska panhandle and

eastern Colorado. But for the dust storm on April 2, 2012, this exceedance would not have occurred.

As demonstrated in Section 3 and particularly in Table 7, the PM_{10} exceedances in Alamosa and Lamar on April 2, 2012, would not have occurred "but for" the large regional dust storm on April 2, 2012.

7.0 References

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Appendix A

Weather Advisories and Text Products
Blowing Dust Event
April 2, 2012

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WWUS75 KPUB 021620
NPWPUB

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PUEBLO CO
1020 AM MDT MON APR 2 2012

COZ084>086-089-093-022230-
/O.EXT.KPUB.HW.W.0009.000000T0000Z-120403T0300Z/
NORTHERN EL PASO COUNTY/MONUMENT RIDGE/RAMPART RANGE BELOW 7500 FT-
COLORADO SPRINGS VICINITY/SOUTHERN EL PASO COUNTY/RAMPART RANGE BELOW 7400 FT-PUEBLO AND VICINITY/PUEBLO COUNTY BELOW 6300 FT-
CROWLEY COUNTY-LA JUNTA VICINITY/OTERO COUNTY-
INCLUDING...BLACK FOREST...AIR FORCE ACADEMY...COLORADO SPRINGS...
PUEBLO...ORDWAY...OLNEY SPRINGS...LA JUNTA...ROCKY FORD
1020 AM MDT MON APR 2 2012

...HIGH WIND WARNING NOW IN EFFECT UNTIL 9 PM MDT THIS EVENING...

THE HIGH WIND WARNING IS NOW IN EFFECT UNTIL 9 PM MDT THIS EVENING.

* LOCATION...EL PASO...PUEBLO...CROWLEY...AND OTERO COUNTIES.

* CAUSE AND TIMING...A STRONG COLD FRONT HAS MOVED THROUGH THE AREA. STRONG TO DAMAGING WINDS ARE EXPECTED TO CONTINUE THROUGH EARLY THIS EVENING.

* WIND...NORTH WINDS 35 TO 45 MPH WITH GUSTS UP TO 60 MPH.

* IMPACT...HIGH WINDS WILL CAUSE STRONG CROSS WINDS ON EAST WEST ORIENTED ROADWAYS SUCH AS HIGHWAYS 94 AND 50...POSING HAZARDS TO HIGH PROFILE VEHICLES. HIGH WINDS MAY ALSO BLOW DOWN TREE LIMBS AND COULD RESULT IN POWER OUTAGES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

HIGH WINDS CAPABLE OF CAUSING POWER OUTAGES AND PROPERTY DAMAGE ARE EXPECTED.

THESE WINDS CAN CAUSE LIGHTWEIGHT OBJECTS TO BECOME DANGEROUS AIRBORNE PROJECTILES. HIGH PROFILE VEHICLES AND VEHICLES PULLING TRAILERS CAN BE FLIPPED BY CROSSWINDS. BLOWING DUST CAN QUICKLY REDUCE VISIBILITY TO NEAR ZERO...RESULTING IN HAZARDOUS DRIVING CONDITIONS AND ACCIDENTS INVOLVING MOTORISTS TAKEN BY SURPRISE. BLOWING DUST OR SAND CAN ALSO BE A HEALTH HAZARD FOR THOSE WITH RESPIRATORY PROBLEMS. SECURE LIGHTWEIGHT OBJECTS. AVOID TRAVELING ON ROADS WITH CROSSWINDS.

$$

COZ069>071-022230-
/O.CON.KPUB.HW.W.0009.000000T0000Z-120403T0300Z/
DEL NORTE VICINITY/NORTHERN SAN LUIS VALLEY BELOW 8500 FT-
ALAMOSA VICINITY/CENTRAL SAN LUIS VALLEY BELOW 8500 FT-
SOUTHERN SAN LUIS VALLEY-
INCLUDING...CENTER...DEL NORTE...ALAMOSA...MONTE VISTA...
MANASSA...LA JARA...ANTONITO...SANFORD...SAN LUIS...
FORT GARLAND...BLANCA
1020 AM MDT MON APR 2 2012

...HIGH WIND WARNING REMAINS IN EFFECT UNTIL 9 PM MDT THIS
EVENING...

A HIGH WIND WARNING REMAINS IN EFFECT UNTIL 9 PM MDT THIS
EVENING.

* LOCATION...THE EAST SIDE OF THE SAN LUIS VALLEY.

* CAUSE AND TIMING...STRONG EAST WINDS ARE EXPECTED TO POUR
  THROUGH THE GAPS AND VALLEYS OF THE SANGRE DE CRISTO MOUNTAINS
  INTO THE EASTERN PORTIONS OF THE SAN LUIS VALLEY.

* WIND...EAST TO NORTHEAST WINDS 35 TO 45 MPH WITH GUSTS UP TO
  70 MPH WILL BE POSSIBLE...WITH THE STRONGEST GUSTS ON THE
  EASTERN SIDE OF THE SAN LUIS VALLEY NEAR THE MOUNTAINS.

* IMPACT...HIGH WINDS WILL CAUSE STRONG CROSS WINDS ON NORTH
  SOUTH ORIENTED ROADWAYS SUCH AS HIGHWAYS 150 AND 159 ON THE
  EAST SIDE OF THE SAN LUIS VALLEY...POSING HAZARDS TO HIGH
  PROFILE VEHICLES. HIGH WINDS MAY ALSO BLOW DOWN TREE LIMBS AND
  COULD RESULT IN POWER OUTAGES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

HIGH WINDS CAPABLE OF CAUSING POWER OUTAGES AND PROPERTY DAMAGE
ARE EXPECTED.

THESE WINDS CAN CAUSE LIGHTWEIGHT OBJECTS TO BECOME DANGEROUS
AIRBORNE PROJECTILES. HIGH PROFILE VEHICLES AND VEHICLES PULLING
TRAILERS CAN BE FLIPPED BY CROSSWINDS. BLOWING DUST CAN QUICKLY
REDUCE VISIBILITY TO NEAR ZERO...RESULTING IN HAZARDOUS DRIVING
CONDITIONS AND ACCIDENTS INVOLVING MOTORISTS TAKEN BY SURPRISE.
BLOWING DUST OR SAND CAN ALSO BE A HEALTH HAZARD FOR THOSE WITH
RESPIRATORY PROBLEMS. SECURE LIGHTWEIGHT OBJECTS. AVOID TRAVELING
ON ROADS WITH CROSSWINDS.

670
FXUS65 KPUB 021607
AFDPUB

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE PUEBLO CO
1007 AM MDT MON APR 2 2012

.UPDATE...
HIGH RES MODELS...HRRR...LOCAL 4 KM WRF ALL POINTING TO POTENTIAL HIGH WIND EVENT FOR THE EASTERN PORTIONS OF THE SAN LUIS VALLEY WHERE EASTERLY WINDS WILL POUR THROUGH THE GAPS AND VALLEYS OF THE SANGRES. GIVEN THE STRONG PRESSURE GRADIENT BEHIND THE FRONT...THIS SEEMS PLAUSIBLE...AND HAVE PUT OUT A HIGH WIND WARNING FOR THE SAN LUIS VALLEY TO ACCOUNT FOR THIS. HRRR AND LOCAL 4 KM WRF ALL INDICATE POTENTIAL FOR GUSTS IN EXCESS OF 60 TO EVEN 70 MPH. SUSPECT THIS WILL BE FAIRLY LOCALIZED TO THE EASTERN FRINGES OF THE SAN LUIS VALLEY. HIGH WIND WARING ALREADY OUT. UPDATED GRIDS AND FORECAST TO FOLLOW SHORTLY. -KT

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.PREV DISCUSSION... /ISSUED 428 AM MDT MON APR 2 2012/

SHORT TERM...

(TODAY AND TONIGHT)

..MAJOR SPRING STORM TO AFFECT OUR AREA...

IRONICALLY...IT LOOKS LIKE THE BIGGEST STORM OF THIS SEASON WILL COME IN SPRING THIS YEAR. A STRONG COLD FRONT HAS ALREADY MOVED THROUGH THE NRN TIER OF OUR CWA THIS MORN..WITH GUSTS TO 40 KT ALREADY BEING REPORTED AT KCOS. THESE WINDS WILL CONTINUE TO INCREASE THROUGH THE MORNING HOURS...WITH SUSTAINED WINDS OF 30-40 KT LIKELY AND SOME GUSTS IN THE 50-60 KT RANGE POSSIBLE. WILL CONTINUE THE HIGH WIND WARNING...AND EXTEND THROUGH THIS AFTERNOON AS IT NOW LOOKS LIKE SUSTAINED WINDS COULD MEET HIGH WIND CRITERIA FOR AT LEAST SOME OF THIS AREA THROUGH THE DAY.

STILL SEEING VERY DRY AND MILD CONDITIONS ACROSS THE PLAINS. TEMPS HAVE BEEN CLIMBING STEADILY AT KPUB WITH FRONTAL SUBSIDENCE. DEWPOINTS ARE RISING CONSIDERABLY BEHIND THE FRONT...BUT REAL MOIST AIR WILL HOLD OFF TIL LATER TODAY. SKIES ARE STILL CLR THIS MORN AND LOW CLOUDS IN THE SAT FOG PRODUCT ARE CONFINED TO NW CO ATTM. HAVE SEEN CONTINUED LIGHT-MDT ECHOES OVR WRN CO ALL MORNING...AND WHILE OBS ARE RATHER DEVOID OF PRECIP...SUSPECT THE HIGHER PEAKS ARE SEEING SOME PRECIP THIS MORN.

THE FRONT WILL SET THE STAGE FOR A VERY DYNAMIC SYSTEM THAT IS NOW MOVING INTO THE 4 CORNERS REGION. THIS SYSTEM WILL CONTINUE TO STRONGLY INTENSIFY AS A VERY STRONG MID LEVEL JET STREAK MOVES THROUGH SRN NM. THE UPPER LOW WILL TRACK JUST S OF KABQ THIS AFTERNOON...AS A CLASSIC AND INFAMOUS 'ALBUQUERQUE LOW'. WILL SEE TEMPS HOLD STEADY OR FALL LATER TODAY AS COLD AIR CONTINUES TO POUR IN BEHIND THE FRONT...AND H7 TEMPS FALL TO MINUS 8 TO MINUS 10 BY THIS EVE.

MAIN ACTION WITH THIS STORM WILL BE TONIGHT...AS THE JET BEGINS TO ROUND THE TROUGH BASE AND THE UPPER LOW MAKE A MOVE TO THE NE. THIS IS THE TRACK THAT HAS BEEN FAVORED BY THE GFS AND ECMWF FOR THE LAST COUPLE OF DAYS...AND THE NAM HAS FINALLY CAUGHT ON TO THIS SOLUTION IN A BIG WAY. TIMING WILL BE PERFECT FOR A HEAVY SNOW EVENT...ESPECIALLY OVER THE HIGHER ELEVATIONS...AND COULD EVEN SEE SOME SNOW AT THE LOWER ELEVATIONS DUE TO THE FAVORABLE OVERNIGHT TIMING AND PRIMED CONDITIONS. WET BULB ZERO WILL FALL STEADILY FROM AROUND 6500 FT TODAY TO AS LOW AS 4500 FEET TONIGHT. EXPECT THAT MOST LOCATIONS ABOVE 6000 FEET...INCLUDING KCOS...WILL SEE SOME SNOW. OF COURSE...WITH VERY WARM GROUND MUCH OF THE EARLY SNOWFALL WILL FAIL TO ACCUMULATE INITIALLY...BUT WITH A GOOD 8-12 H PERIOD OF SNOW COULD SEE SOME LIGHT ACCUMS FOR THE I-25 CORRIDOR. KCOS LOOKS TO BE SOLIDLY BELOW FZG FOR THE MAIN EVENT...AS THE TROWAL REALLY KICKS IN FROM 03Z TO 12Z OVERNIGHT. ANY PRECIP BEFORE 03Z WILL LIKELY BE RAIN OR A RN/SN MIX. N WINDS MAY LIMIT PRECIP FOR S EL PASO AND N PUEBLO COUNTIES...BUT VERY STRONG ISENTROPIC LIFT MAY OVERCOME SOME OF THE DOWNSLOPE DRYING EFFECT.

AS FOR 'WINTER' HEADLINES...HAVE CONVERTED OUR WATCH TO A WARNING...AND ADDED THE WET MOUNTAIN VALLEY AS WELL. WOULD NOT BE SURPRISED TO SEE IN EXCESS OF 2 FEET FOR THE HIGHEST ELEVATIONS OF THE WETS/SANGRES...IF CURRENT PROGS PAN OUT AS EXPECTED. RATON PASS WILL BE PARTICULARLY PROBLEMATIC TONIGHT AND TUE AS STRONG N WINDS COMBINE WITH SN TO PRODUCE WHITE OUT CONDITIONS AT TIMES. CONSIDERED UPGRADING TO A BLIZZARD WARNING FOR THE RATON...BUT CURRENTLY DOES NOT LOOK LIKE WINDS WILL BE SUSTAINED LONG ENOUGH...AND HEAVIEST PRECIP OCCURS AFTER THE STRONGEST WINDS. HOWEVER...WILL NEED TO WATCH THIS AREA CLOSELY. ALSO HAVE INTRODUCED A WINTER STORM WATCH FOR TELLER AND N EL PASO FOR TONIGHT AND TUE. COULD GET PRETTY NASTY OVER MONUMENT HILL BY TUE. HOPEFULLY THIS STORM WILL PUT A DENT IN THE DROUGHT. LET IT SNOW! 44

LONG TERM...

(TUESDAY - SUNDAY)

..BENEFICIAL PRECIP AT THE BEGINNING OF THE PD THEN DRYING OUT AGAIN...

MODELS IN THE EARLY PART OF THIS FCST PD HAVE COME INTO GOOD AGREEMENT

BRINGING THE CUTOFF LOW NORTHEASTWARD ACROSS SE CO.

BY 12Z TUESDAY...SNOW AND RAIN SHOULD BE ONGOING ACROSS A GOOD PART OF THE REGION...WITH THE BEST CHANCE OF PRECIP OVER THE EAST FACING SLOPES OF THE MTNS ADJ TO THE PLAINS...AND THE RATON MESA AND PALMER DVD REGIONS. THE RAIN/SNOW LINE AT 12Z WILL LIKELY BE AROUND 5000 FEET. FOR THE MORNING RUSH HOUR...SNOW WILL LIKELY NOT ACCUMULATE MUCH ON ROAD SURFACES BETWEEN 5000 AND 6500 FEET...BUT ANYTHING ABOVE 6500 FEET WILL LIKELY BECOME SLUSHY. GRASSY SFCS BETWEEN THE AFOREMENTIONED ELEVATIONS WILL LIKELY ACCUMULATE SOME SNOW...SO THE PUEBLO AREA MAY SEE AN INCH OF MEASURABLE SNOW. OVERALL...TWO TO THREE INCHES OF SNOW WILL LIKELY OCCUR ACROSS THE EASTERN MTNS/RATON MESA AND PALMER DVD...WITH LOCALLY HEAVY ACCUMS ACROSS PIKES PEAK AND THE HIGHER ELEVATIONS OF THE EAST SLOPES OF THE WETS/SANGRES.

BY MIDDAY TUESDAY...THE LOW CENTER ALOFT WILL LIKELY BE IN THE SE CO AREA AND 700 MB FLOW WILL BECOME MORE NORTHERLY ACROSS THE WETS/SANGRES. THIS SHOULD ALLOW THE SNOW TO DECREASE ACROSS THESE REGIONS AS THE FLOW WILL NOT BE AS FAVORABLE...BUT FARTHER NORTH ACROSS THE GREATER PIKES PEAK REGION MODEST NE 700 MB FLOW WILL BE ONGOING. LIKEWISE...THE PALMER DVD REGION AND RAMPARTS/PIKES PEAK WILL LIKELY SEE SNOW CONTINUING. THE RAIN/SNOW LINE SHOULD INCREASE A BIT DURING THE DAY...BUT NOT BY MUCH.

BY LATE IN THE DAY TUESDAY THE RAIN/SNOW SHOULD PRETTY MUCH BE OVER ACROSS THE PLAINS...HOWEVER BOTH NAM/GFS SHOW WRAP AROUND PRECIP CONTINUING OVER THE HIGHER TRRN OF THE MTNS..ESPECIALLY THE SANGRES AND SAN JUANS. FOR THIS REASON I HAVE INCREASED POPS OVER THESE REGIONS DURING THIS TIME. NOTE THAT THE WINTER STORM WARNING FOR THE SANGRES EXPIRES AT 00Z WED. IF THE MODELS ARE CORRECT...THIS WARNING MAY NEED TO BE EXTENDED FOR THIS MTN RANGE BY ABOUT 6 HOURS OR SO.

AS FOR HIGH TEMPERATURES ON TUESDAY...I HAVE DECREASED THEM...WITH TEMPS REACHING ABOUT 40F ALONG THE I-25 CORRIDOR REGION...AND THESE VALUES MAY BE A BIT TOO HIGH IF THE MODEL SOUNDINGS ARE CORRECT. OVER THE FAR E PLAINS AND SAN LUIS VALLEY...HIGHS SHOULD BE ABOUT 50F.

AS FOR THE REST OF THE FCST...WE WILL BE RETURNING TO A DRY PATTERN AGAIN AS SW FLOW GRADUALLY RAMPS UP ONCE AGAIN. IF WE DO GET AS MUCH PRECIP AS THE MODELS ARE INDICATING...THEN FIRE WX CONCERNS SHOULD DROP SIGNIFICANTLY ACROSS THE FCST AREA. ATTM...THE WARMEST TEMPS SHOULD BE DURING THE FRI-SAT TIME FRAME WITH A DRY PAC FRONT COMING ACROSS THE REGION SAT NITE. TEMPS WILL COOL AGAIN ON SUNDAY.

THE NEXT CHANCE OF PRECIP...ACCORDING TO THE GFS WILL BE MONDAY...BUT THE EC SIMULATION IS DRY FROM WED THROUGH NEXT WEEK.
\/34

AVIATION...

STRONG N WINDS BEHIND A COLD FRONT WILL CONTINUE TO AFFECT KCOS AND KPUB THROUGH THE NEXT 6-12 H. SUSTAINED WINDS FORM 30-40 KTS WITH HIGHER GUSTS WILL BE POSSIBLE. WINDS WILL GRADUALLY DIMINISH THIS EVE...HOWEVER...PRECIP IS EXPECTED TO BECOME MORE LIKELY OVERNIGHT...WITH A GOOD CHANE OF SN AT KCOS AND A RAIN-SNOW MIX POSSIBLE AT KPUB LATER TONIGHT. ALONG WITH GUSTY WINDS VIS IS EXPECTED TO BE LOW OVERNIGHT IN PARTICULAR. KALS WILL ALSO SEE GUSTY NE WINDS AND THE CHANCE OF SOME SHSN...BUT THE WORST CONDITIONS WILL BE ALONG AND W OF I-25. 44

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.PUB WATCHES/WARNINGS/ADVISORIES...
HIGH WIND WARNING UNTIL 6 PM MDT THIS EVENING FOR COZ084>086-089-093.

WINTER STORM WARNING FROM 6 PM THIS EVENING TO 6 PM MDT TUESDAY FOR COZ078-087-088.

WINTER STORM WARNING UNTIL 6 PM MDT TUESDAY FOR COZ072>075-079-080.

HIGH WIND WARNING UNTIL 9 PM MDT THIS EVENING FOR COZ069>071.

WINTER STORM WATCH FROM 9 PM MDT THIS EVENING THROUGH TUESDAY AFTERNOON FOR COZ081-082-084.

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782
WWUS75 KBOU 020252
NPWBOU

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE DENVER CO
852 PM MDT SUN APR 1 2012

...STRONG WIND GUSTS EXPECTED LATE TONIGHT THROUGH MONDAY MORNING OVER THE PLAINS OF NORTHEAST COLORADO...

.A STRONG COLD FRONT WILL MOVE THROUGH NORTHEAST COLORADO AFTER MIDNIGHT TONIGHT. A STRONG PRESSURE GRADIENT WILL RESULT IN

STRONG NORTH WINDS ON THE PLAINS LATE TONIGHT THROUGH MONDAY MORNING.

COZ038-042>051-021100-
/O.CON.KBOU.HW.W.0008.120402T1000Z-120402T1800Z/
LARIMER COUNTY BELOW 6000 FEET/NORTHWEST WELD COUNTY-
NORTHEAST WELD COUNTY-CENTRAL AND SOUTH WELD COUNTY-MORGAN COUNTY-
CENTRAL AND EAST ADAMS AND ARAPAHOE COUNTIES-
NORTH AND NORTHEAST ELBERT COUNTY BELOW 6000 FEET/NORTH LINCOLN
COUNTY-
SOUTHEAST ELBERT COUNTY BELOW 6000 FEET/SOUTH LINCOLN COUNTY-
LOGAN COUNTY-WASHINGTON COUNTY-SEDGWICK COUNTY-PHILLIPS COUNTY-
INCLUDING THE CITIES OF...FORT COLLINS...HEREFORD...LOVELAND...
NUNN...BRIGGSDALE...GROVER...PAWNEE BUTTES...RAYMER...STONEHAM...
EATON...FORT LUPTON...GREELEY...ROGGEN...BRUSH...FORT MORGAN...
GOODRICH...WIGGINS...BENNETT...BYERS...DEER TRAIL...LEADER...
AGATE...HUGO...LIMON...MATHESON...FORDER...KARVAL...KUTCH...
PUNKIN CENTER...CROOK...MERINO...STERLING...PEETZ...AKRON...
COPE...LAST CHANCE...OTIS...JULESBURG...OVID...SEDGWICK...
AMHERST...HAXTUN...HOLYOKE
852 PM MDT SUN APR 1 2012

...HIGH WIND WARNING REMAINS IN EFFECT FROM 4 AM TO NOON MDT
MONDAY...

* TIMING...THE WINDS WILL INCREASE RAPIDLY BEHIND A COLD FRONT
  LATER TONIGHT AND CONTINUE THROUGH MONDAY MORNING...THEN
  DECREASE THROUGH THE AFTERNOON.

* WINDS...NORTH WINDS 30 TO 40 MPH WITH GUSTS TO 55 MPH POSSIBLE.

* IMPACTS...MANY TREES HAVE BEGUN TO LEAF OUT...SO EXPECT SOME
  DAMAGE TO TREE BRANCHES. RESIDENTS ARE ALSO URGED TO BRING
  INDOORS ANY LOOSE ITEMS SUCH AS GARBAGE CANS AND PATIO FURNITURE
  THAT MAY BE BLOWN ABOUT BY THE STRONG WINDS..

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS THAT STRONG AND POTENTIALLY
DAMAGING WINDS ARE EITHER OCCURRING OR HIGHLY LIKELY.

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422
WWUS75 KCYS 010906
NPWCYS

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE CHEYENNE WY
306 AM MDT SUN APR 1 2012

...WIND ADVISORY IN EFFECT FROM LATE SUNDAY NIGHT THROUGH MONDAY AFTERNOON FOR THE WESTERN NEBRASKA PANHANDLE...

.A STRONG COLD FRONT WILL SURGE EAST ACROSS THE WESTERN NEBRASKA PANHANDLE SUNDAY EVENING. BEHIND THE FRONT...STRONG AND GUSTY NORTHWEST WINDS WILL DEVELOP AND PERSIST THROUGH MONDAY AFTERNOON.

NEZ002-003-019>021-054-055-095-096-012300-
/O.NEW.KCYS.WI.Y.0016.120402T0600Z-120403T0000Z/
DAWES-BOX BUTTE-SCOTTS BLUFF-BANNER-MORRILL-KIMBALL-CHEYENNE-
NORTH SIOUX-SOUTH SIOUX-
INCLUDING THE CITIES OF...CHADRON...ALLIANCE...SCOTTSBLUFF...
GERING...HARRISBURG...BRIDGEPORT...BAYARD...KIMBALL...SIDNEY...
HARRISON...AGATE
306 AM MDT SUN APR 1 2012

...WIND ADVISORY IN EFFECT FROM MIDNIGHT TO 6 PM MDT MONDAY...

THE NATIONAL WEATHER SERVICE IN CHEYENNE HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT FROM MIDNIGHT TO 6 PM MDT MONDAY.

* TIMING...GUSTY NORTHWEST WINDS WILL DEVELOP FOLLOWING THE PASSAGE OF A STRONG COLD FRONT SUNDAY EVENING...AND WILL CONTINUE THROUGH MONDAY AFTERNOON.

* WINDS...NORTHWEST 25 TO 35 MPH WITH GUSTS OF 40 TO 50 MPH.

* IMPACTS...THE STRONG WINDS AND SUDDEN GUSTS WILL CREATE HAZARDOUS TRAVEL FOR THOSE IN LIGHT WEIGHT OR HIGH PROFILE VEHICLES.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WIND ADVISORY MEANS THAT WINDS OF 35 MPH ARE EXPECTED. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. USE EXTRA CAUTION.

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JAMSKI

Air Quality Advisory

Denver Metro/Front Range:
Issued: 4/2/2012 10:36:00 AM
No Advisories - No Action Day
Effective: 4/2/2012 10:00:00 AM - 4/2/2012 4:00:00 PM
Air Quality along the Front Range will be in the Good-to-Moderate range.

Other Areas:
Blowing Dust Advisory Portions of Eastern Colorado and the San Luis Valley: 10 AM to 4 PM Monday in areas including Pueblo, Springfield, Lamar, La Junta, Trinidad, Alamosa and Las Animas.

In areas where blowing dust has reduced visibilities to less than 10 miles, people with heart or lung disease, older adults, and the very young should reduce prolonged or heavy indoor or outdoor exertion.

Monday, April 2, 2012

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1530Z April 2, 2012

Blowing Dust

Eastern Colorado-
Several areas of blowing dust continue to originate in Colorado.
Southward moving dust was visible at sunrise in Cheyenne, Lincoln,
Crowley and Pueblo Counties. These areas of dust moved near the New
Mexico/Colorado border by 1530Z.

Myrga

Monday, April 2, 2012

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 0015Z April 3, 2012

Blowing Dust

A deep storm center over New Mexico was producing strong winds over the

southwest Plains from northern Mexico into west Texas that was kicking up a broad area of blowing dust. The dust was mainly originating from several sources in northern Chihuahua and west Texas in the vicinity of Midland and Lubbock. The dust was curling counterclockwise across the region and extended to near Wichita Falls and the Texas Panhandle by sunset. Another smaller area of blowing dust was seen this afternoon north of the storm center in the Great Sand Dunes National Preserve of south central Colorado. This area was moving o the west.

Remnant blowing dust was mixing with some smoke from the fires noted above and moving north northeast ahead of a cold front and extended from eastern Kansas into Iowa.

An area of blowing dust was detected moving south into the northern Gulf of California.

Ruminski